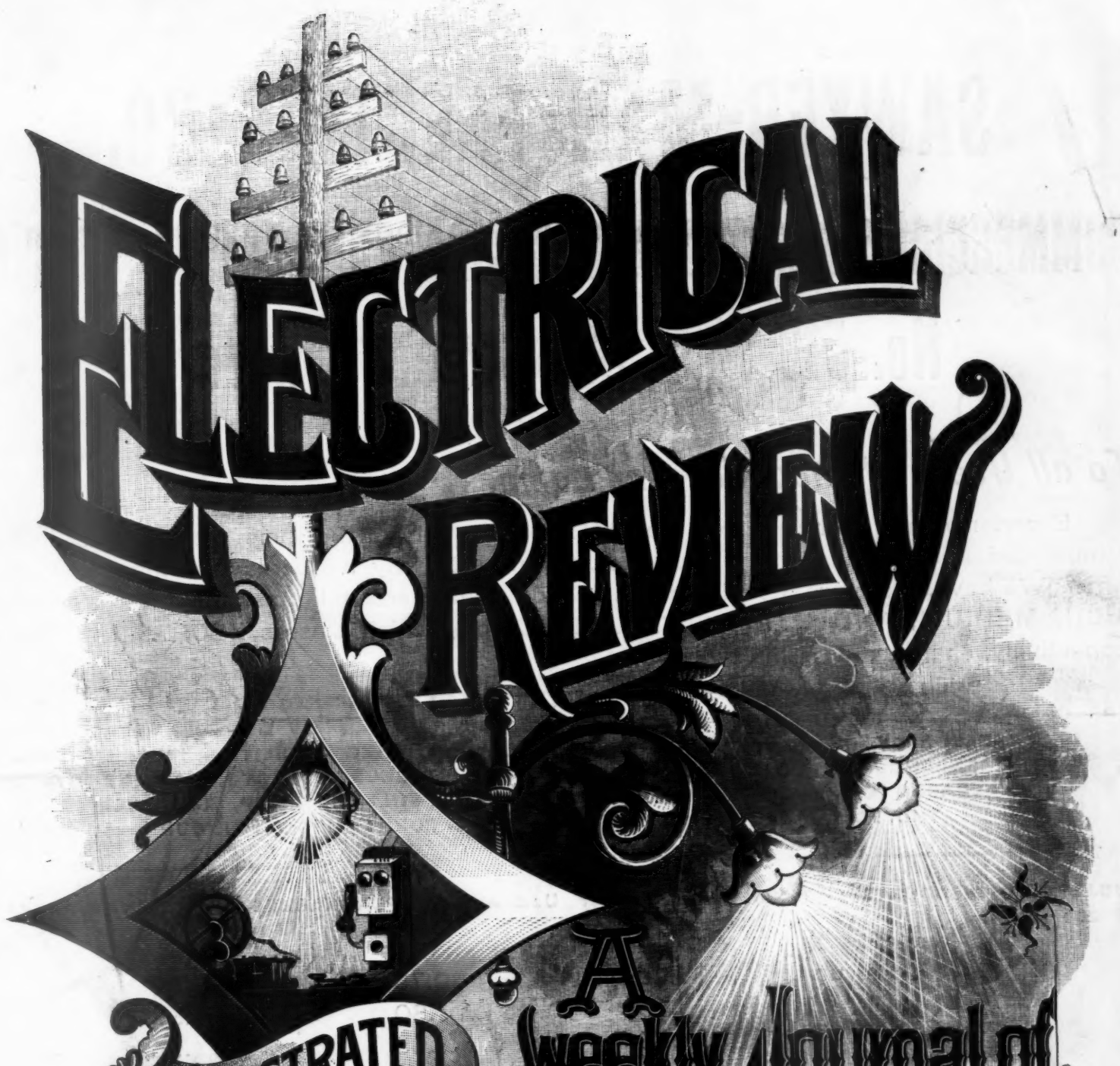

ILLUSTRATED

A weekly Journal of

ELECTRIC LIGHT AND POWER, TELEGRAPH, TELEPHONE & SCIENTIFIC PROGRESS.

Vol. 13, No. 1.
September 1, 1888.

NEW YORK, U.S.A.

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SAWYER-MAN ELECTRIC CO.,

COMMERCIAL AGENT OF THE CONSOLIDATED ELECTRIC LIGHT CO.

No. 510 West 23d Street, New York,

August 1st, 1888.

To all Users of Incandescent Lamps:

Experience has demonstrated that the life and utility of the Incandescent Electric Lamp is increased and the cost of its manufacture diminished by a decrease of the electromotive force. We have, therefore, decided to divide our commercial lamps into three classes, viz: HIGH, MEDIUM, AND LOW VOLTAGE LAMPS; of which classes, 100, 75, and 50 volts, respectively, shall stand as the types.

THIS COMPANY, THE FIRST TO GIVE TO THE CONSUMER THE BENEFIT OF SUCH CLASSIFICATION, IS ENABLED, BY REASON OF INCREASED MANUFACTURING FACILITIES, AFFORDED BY THE ENLARGEMENT OF OUR NEW YORK AND PITTSBURGH FACTORIES, AND BY REASON OF VALUABLE IMPROVEMENTS MADE IN THE LAMP, TO OFFER THE FOLLOWING REDUCTION IN PRICES FOR LAMPS WITH OUR

STANDARD BASES

SUBJECT TO DISCOUNTS FOR CENTRAL STATION USE AND TO PURCHASERS OF ORIGINAL PACKAGES OF 250 EACH.

C. P.	50 Volt.	75 Volt.	100 Volt.
16, and under,	$0.70	$0.75	$0.80
20,	.75	.80	.85
24,	.80	.85	.90
32,	.90	.95	1.00

THREE CENTS WILL BE PAID FOR THE RETURN OF EVERY LAMP BASE WITH THE PLATINUM WIRE INTACT, DELIVERED IN GOOD ORDER AT EITHER OF OUR FACTORIES.

For the purpose of obtaining uniformity of production, and of reducing the cost of manufacture, we offer to purchasers of our lamps our Standard Sockets, without charge, in exchange for any other socket in use by them.

CORRESPONDENCE SOLICITED.

SAWYER-MAN ELECTRIC COMPANY.

ELECTRICAL REVIEW

ILLUSTRATED.

A WEEKLY JOURNAL OF

Electric Light, Power, Telephone, Telegraph and Scientific Progress.

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The United States Company's Dynamo.

The cut on this page is the best representation of the well-known United States dynamo, as it is at present, which we have seen. This dynamo is too well known to need a detailed description here; but, while in all essential points it is practically the same as a year or two ago, it has been much improved lately in some matters of detail, and its general proportions somewhat changed, so that it is even more symmetrical than before.

The standard electro-motive force of these machines for multiple arc incandescent lighting is 110 volts, and a very remarkable feature is the constancy of the E. M. F. under extreme variations of load.

Though a simple shunt wound machine, it is equal in this respect to any compound wound dynamo, which makes it an unusually simple and easy machine to operate, and one especially well adapted for storage battery and motor work.

The United States Company has recently made some very large machines for this work, notably: Two for the Julien Traction Company, for the station at 85th street and Madison avenue; and several for the Electrical Accumulator Company, 44 Broadway.

The mechanical work on these dynamos is particularly fine and worthy of the highest commendation; and a close examination of it in all details convinces one that the United States Company is endeavoring to make as good a machine as possible, and is in no respect sacrificing efficiency to reduce cost.

The natural result of this policy is a large and steadily increasing business, to meet the demands of which the United States Company is now building a very large addition to its machine shop. This, with the new lamp factory recently finished, will make it a very extensive establishment; and the excellence of the work done in recent United States installations is a good assurance that it will be kept busy.

Electric Motor Test.

Mr. T. L. Johnson, of Cleveland, Ohio, and Mr. A. V. Du Pont, of Louisville, Ky., have been investigating electric railways in the East for some time past, and being desirous of ascertaining the amount of power which could be developed by the motors used on the Thomson-Houston Company's motor trucks, the following test was made at Crescent Beach:

To the motor car was attached an ordinary passenger car containing about 20 passengers. As soon as the passengers were seated, the brakes were set up hard so that it was impossible for the wheels to revolve, and the current turned on. The two cars moved off slowly, but gradually increased the speed to six miles per hour, which speed was maintained on the curves and up a grade of two and one-half per cent. The gentlemen were much pleased with the result of this test, and expressed themselves in the highest terms regarding the peformance of the motors. It certainly goes without saying, that trucks which could stand such a strain as this, and motors which are able to perform the work in such an eminently satisfactory manner, must be of a superior quality.

Mr. E. G. Acheson, of Pittsburgh, has been making a number of experiments with high tension currents, and will read a paper before the National Electric Light Association, giving an account of the results obtained,

The Electric Exchange and Its Work.

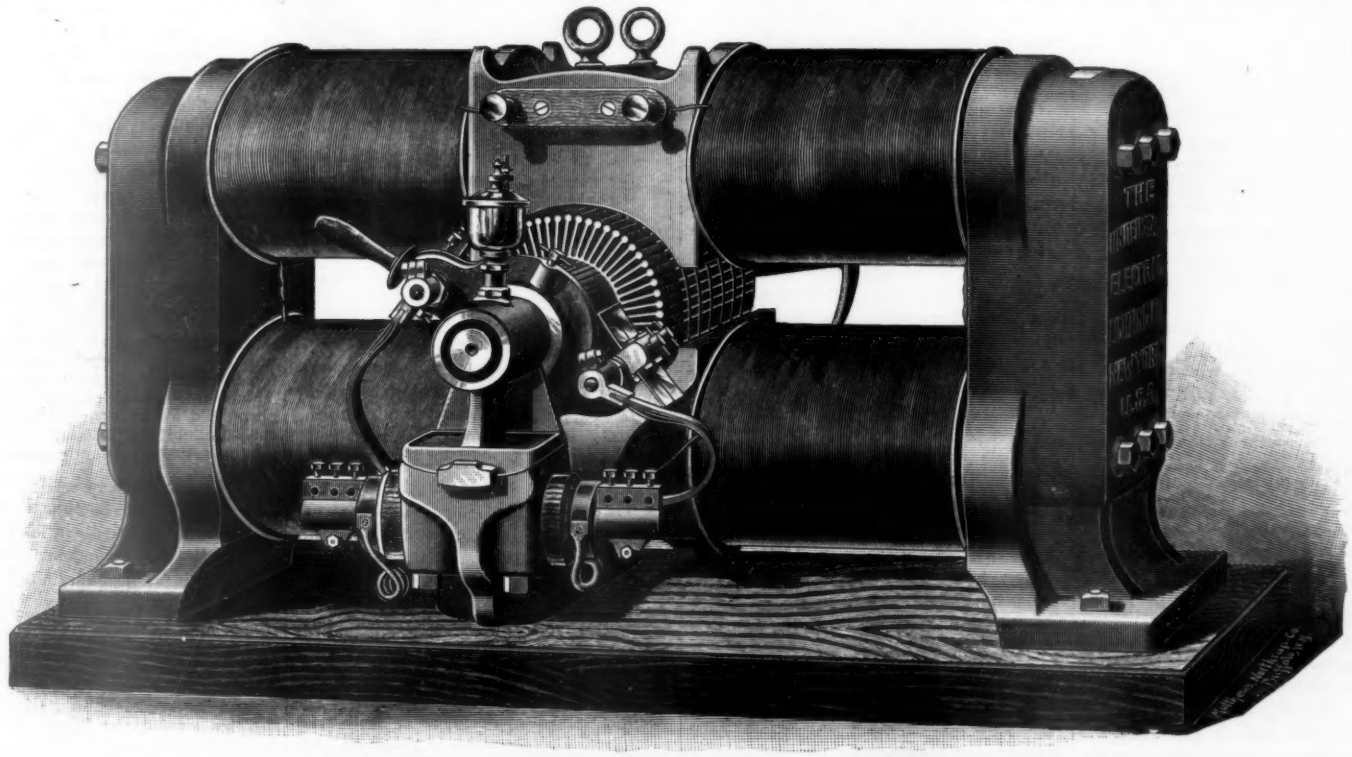
The New England Electric Exchange, acting in conjunction with the New England Insurance Exchange and the Boston Fire Underwriters' Union, is rapidly progressing with the work of licensing those engaged in the operation and installation of electric plants, and as the aims and methods of the Exchange have become better understood it has received a constantly increasing support from all interested. The examinations are purely practical and are conducted in such a way as to arrive at the actual qualifications of the applicant, so that the license when issued shall fairly and definitely represent the extent of work which he is competent to perform.

The Insurance Exchange is very decided in the position it has taken as outlined in its circular of June 11th, and is now calling the attention of local companies and of the owners of isolated plants to the near approach of October 1st, the date on and after which the license of the Electric Exchange becomes a necessity.

As the number of applicants is rapidly increasing, and in order to provide for the many who must be examined before October 1st, the directors have still further increased the number of examiners and have appointed examinations as follows, in addition to regular weekly examinations in Boston:

New Haven, Conn.....	Sept. 12
Waterville, Me.....	" 19
Bellows Falls, Vt.....	" 26

All applications are acted upon as soon as received, and the applicants notified as promptly as possible when and where to appear for examination.



THE UNITED STATES ELECTRIC LIGHT COMPANY'S DYNAMO—A HANDSOME MACHINE.

Electricity's Apostles.

KNIGHTS OF LIGHT AND POWER GATHERING IN NEW YORK CITY—OPENING OF A PROMISING CONVENTION OF THE NATIONAL ELECTRIC LIGHT ASSOCIATION — MANY QUESTIONS OF INTEREST AND VALUE TO BE DISCUSSED BY PRACTICAL AND SCIENTIFIC MEN.

For many days the local electrical fraternity has been welcoming numerous visitors from the west and east, the south and north, and the explanation ever given is that "we are here for the conventions"—meaning the Electric Light and Telephone Conventions, both of national influence, and occurring on succeeding weeks in this city. The first convenes at the Hotel Brunswick at 12 o'clock Wednesday of this week, and will remain in convention until Friday afternoon. The proceedings, as the REVIEW goes to press Tuesdays, will appear in next week's issue of this journal, complete and interesting as of old.

At the time of writing, the attendance is such as to make certain that this will be the largest gathering yet held under the auspices of the Association, and it is but natural that it should be so, when we consider the rapid growth of the electrical industries, the many new discussions that have been brought out since the last meeting, and last, but not least, the location, for New York City is a place where every man can have business at least once a year—and it has been three years since the Electric Light Association met here.

Dr. Otto A. Moses, the busy Chairman of the Executive Committee, has been indefatiguable in his efforts to see that suitable ac-

(Continued on page 5.)

The Decision on the Thomson-Houston Dynamo Regulator.

We are able to give our readers the opinion of Judge Colt, of the Circuit Court of the United States, District of Massachusetts, in the case of the Thomson-Houston Electric Company *vs.* Citizens' Electric Light Com-Company *et al.*, given August 14th, 1888. The case is important, and we publish the opinion in full:

This suit is brought for the infringement of letters patent No. 238,315, granted Elihu Thomson and Edwin J. Houston, March 1, 1881, for improvements in current regulators for dynamo-electric machines. The specification says:

The object of our invention is to provide improved means for controlling automatically the strength of an electric current flowing over a circuit composed of a dynamo-electric machine and one or more electric lamps, or other appliances, through which the current passes, and to obtain said control without the introduction of resistances as such, and without varying the speed or field of the dynamo-electric machine, and at the same time, if desired, to utilize the reaction principle for the magnetization of said dynamo-electric machine, or in other words, to cause the current generated to pass the field-magnet coils. We accomplish these results at the same time that the power expended to drive the dynamo-electric machine varies directly in accordance with the changed resistance of its circuit, being less as the resistance is less, and greater as the resistance is greater. * * * * *

In the improved system of operation provided by our present invention, we possess the ability to cut out lamp after lamp from circuit, and yet maintain a uniform current strength in the remaining lamps and economy of motive power proportional to the diminished resistance, while the normal light-giving power of each lamp not cut out is maintained, and an absence of heating or necessity for any other adjustments than those at the commutator of the machine obviated. These adjustments are preferably made automatic, for we find that with the commutator used by us, as herein specified, a proper adjustment of the commutator being effected when a certain resistance is in circuit, a similar adjustment will, when the resistance is changed, give the same current. In our system we have employed a dynamo-electric machine in which the commutator is constructed of three insulated segments of a ring connected to three armature coils. The collecting brushes applied to said commutator are supported so as to be movable around the commutator without changing the relative positions of the two collectors. This movement of the collecting brushes is well known in the art. * * * * *

We find in practice, moreover, that we obtain with this automatic regulation of the current strength an independence of speed variations in the machine, it being only necessary to so adjust the speed of running that when the speed is at its lowest the machine shall yet be sufficient in power to maintain the number of lights placed in its circuit. We are therefore able to operate successfully under conditions of motive power variations that have hitherto been recognized as fatal to steadiness of light obtained.

In United States Patent No. 223,659, January 20, 1880, before referred to, we have described a means of automatically adjusting the commutator-collectors of dynamo-electric machines, which method is adaptable to the present case of current regulation. * * * * *

Our present method of operating, therefore, so far as it relates to automatic regulation, is based upon the same principles of operation as our previous invention; and it consists in an improved construction and mode of use of the apparatus employed in Patent No. 223,659.

We claim:

1. In a current-regulator for a dynamo-electric machine, the combination of a device responding to changes in the main or generated current, a shifting commutator for said machine, and mechanism controlled by said responsive device to shift the commutator to those positions where the current taken up by said commutator shall be constant.
2. In a current-regulator for a dynamo-electric machine, an electro-magnetic device acted upon by variations in the main or generated current, an adjustable or shifting commutator for the machine, and mechanism controlled by said electro-magnetic device to adjust the commutator to those positions where the main or generated current taken up by said commutator shall be constant.

The main defence in this case is that the prior patent No. 223,659, issued to these complainants, is an anticipation of the patent in suit. Upon careful examination of the two patents in connection with the testimony of experts and the able arguments of counsel, I cannot agree with the position taken by the defendants. The object of the two patents, as disclosed by their titles, is different; the patent in suit is for a current regulator for dynamo machines, the earlier patent is for an automatic adjuster for commutator-brushes on magneto-electric machines. Current regulation, or "to provide improved means for controlling automatically the strength of the electric current," is the object of the patent in suit, while the object of the prior patent was the construction of an automatic adjuster for commutator-brushes, "whereby an automatic adaptation to variations of circuit resistance is secured, and the burning and destructive effects of false adjustments obviated." The design of the present patent is to adjust the commutator to those positions which shall keep the current constant; the design of the prior patent was to adjust the commutator so as to keep the current at its maximum value, or in other words, to adjust the brushes so that their contacts with the commutator segments should be at the neutral points, by which means the difficulty from sparking would be reduced to a minimum. It is true that the means employed in both patents to accomplish these different results bear a close relation to each other. The patentees declare that the earlier method described is adaptable to the present case of current regulation, but they also say that their present method consists in an improved construction and mode of use of the apparatus employed in the prior patent. To construct an automatic adjuster which shall avoid sparking or leakage by bringing the brushes in contact with the commutator-segments at the neutral line, or the points of the maximum difference of potential between the segments, and, therefore, of maximum current, may be an important invention, but it is certainly quite a different invention to adjust the brushes of the commutator to positions which shall keep the current constant, independently of the question whether the brushers touch the segments at the neutral points, or whether sparking is avoided.

It is said that the present invention is shown in figures 1 or 2 of the earlier patent. The testimony of defendants' experts seems to find the invention described in Fig. 1, while the learned senior counsel for defendants appears to reject this contention and turns to Fig. 2 as an anticipation of the patent in suit. I do not find in Fig. 2 of the earlier patent the combination of mechanism which forms the subject matter of the claims of the patent now under consideration. I do not find that which constitutes the important thing in the present invention, namely, the responsive device responding to changes in the main or generated current. In respect to Fig. 1, the most that can be said is that it imperfectly describes that which was perfected in the subsequent patent now in controversy. It seems to me in other words that the language of the specification is strictly accurate where it declares that the present invention "consists in an improved construction and mode of use of the apparatus employed in patent No. 223,659."

Upon the subject of infringement I have no doubt. The question is not as to the form of dynamo the defendants may use or whether their machine may be adjusted by hand to avoid sparking, but the question is whether they use the complainants' invention by the employment of substantially the same means to accomplish the same result, namely, the regulation of the current by means of a device responding to changes in the main or generated current, and this the complainants have shown.

Let a decree be entered as prayed for in the bill.

Decree for complainants.

Electric Motor Cars Carry 15,000 People a Day.

What electrical railways can do, and are doing, will electrify the average reader at first hearing, and he will instinctively entrench himself in incredulity, shouting the familiar slogan, "reporters' yarns." But facts are stubborn things, and an official report of the superintendent of the Seashore Electric Railway (Daft system), Asbury Park, N. J., comes from too competent an authority, and is too easily verifiable to leave the skeptic the slightest excuse for shutting himself up in his bastion.

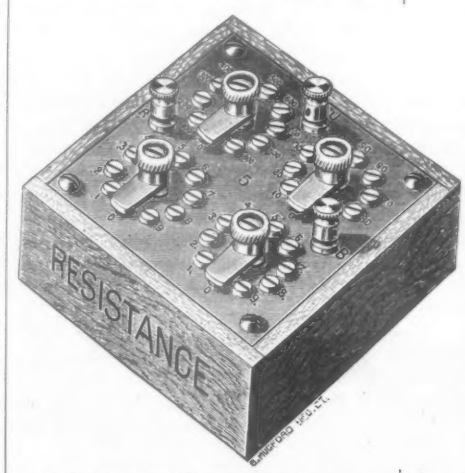
Such a report was received by the Daft Electric Light Company on August 16th, and was to the effect that, on the preceding day—the occasion of the Republican League Convention of the State of New Jersey, Asbury Park—15,000 passengers were carried by the Seashore Electric Railway without the slightest accident of any kind, and without any delay. This was done with 16 motor cars, and the average number of passengers per car was nearly 940. How is this for electrical propulsion?

The Pittsburgh Motor Company, operating under the patents of the Bentley-Knight Electric Railway Company, held a stockholders' meeting last week and elected the following officers and directors: C. L. Magee, Jas. B. Scott, John E. Ridall, C. C. Scaief, H. S. A. Stewart, A. M. Neeper, Pittsburgh; J. L. Blackwell, R. W. Blackwell, George S. Renault, New York. Officers—John E. Ridall, president; James B. Scott, vice-president; W. L. Eaton, secretary; F. C. Hutchinson, treasurer. Executive committee—John Ridall, C. L. Magee, James C. Scott.

The Waterhouse Differential Galvanometer and Rheostat.

This apparatus is admirably adapted to the every day needs of a workshop or laboratory where the very fine measurements are not especially necessary. The coils are under the needle and dial, and therefore a clear view of the needle is obtainable. The dial

is polished german silver, and thus a mirror is not necessary to take an accurate reading of the needle's position. Everything is enclosed. For resistance measurements, a very convenient form of box is furnished, having



WATERHOUSE GALVANOMETER AND RHEOSTAT.

four dials and contact arms are exposed on the top, ordinarily reading from .1 ohm to 1,000 ohms.

The apparatus is very convenient and light, and lacks only a finger key for the contacts, but we presume this is provided when required. The apparatus is manufactured by the Waterhouse Electric and Manufacturing Company, Hartford, Conn.

The Telephone Sharpens the Hearing.

"The idea that a person's hearing is impaired by the constant use of the telephone is ridiculous," said General Manager Plush of the Bell company of Philadelphia. "I see that a professor in Berlin has laid claim to having discovered what he calls 'telephone deafness,' but it is my candid opinion that he is looking for public notoriety. Come upstairs and talk to the girls yourself." The reporter walked up a flight of stairs and passed into a room where a score of girls were sitting in front of switchboards and operating tables. What the manager said was fully concurred in by several of the young ladies who were spoken to.

"I have been working in this office for three years," said one girl, "and I feel quite sure that my hearing has improved since I came here. I can distinguish the faintest sound on the wire, or anywhere else, and I have a great deal of fun sometimes listening to the conversation of people who think I am not within hearing distance. I have never had any trouble with my ears, and a doctor who was treating me a short time ago said the gentle current of electricity that passed into the ear was highly beneficial."

An eminent specialist in diseases of the eye and ear, told the reporter that a gentle current of electricity could not fail to be of benefit to any of the human functions. It is good for rheumatism, and when applied to the ear makes the cympanum more acute, and has a tendency to put greater life and vigor into the brain.

Recent Work of the Mather Electric Company.

The Mather Electric Company is installing a plant of 2,000 lamps at the factory of the American Watch Company, Waltham, Mass. The Weston lamps to the number of 500 were already in use in the factory. The summer business of the Mather Company is largely in excess of that of any previous year, and, besides the 2,000 light plant at Waltham, they are putting in 2,000 lights at Cheney Brothers Silk Mills, South Manchester, Conn.; 500 lights in S. R. Read's Hotel, at Chattanooga, Tenn.; 600 lights in Irving Hall, New York; 300 lights in D. Mackintosh Sons & Company's woolen mill, Holyoke, Mass.; 750 lights in the Plimpton Manufacturing Company, and the Government Envelope Works, at Hartford; 300 lights in the Institution for the Deaf and Dumb, Council Bluffs, Iowa; 200 lights in the Court House, at St. Joseph, Mo.; 200 lights in Harrison Brothers & Company's, Philadelphia; besides a number of small plants from 75 to 150 lights.

The REVIEW is pleased to call attention to this rapidly growing work of the Mather Company, which is one of the best managed and thoroughly reliable companies in the business, although ranking among the newer parent organizations in the electrical field.

Fast Time Over a Long Distance.

The Union Pacific claims the distinction of having made the fastest long distance run west of Chicago. Mr. G. B. Markle, a business man of Portland, Oregon, received a telegram Tuesday from Chicago notifying him that his father was lying at the point of death, and bidding him get there in as short a time as possible. Mr. Markle hired a special train, with the privilege of travelling as fast as he desired, and Thursday evening at 6 o'clock left Portland and arrived here at 6.52 Thursday night. The average rate of speed, including stops, between Cheyenne and Omaha was forty-nine miles per hour. The rate between Portland and Cheyenne, taken collectively, was forty-eight miles per hour.

There has arrived here, says the Des Moines *Leader*, 27,000 pounds of wire, the insulators and cross wires, for the electric street railway, and the company but waits upon the poles ordered some time ago, before commencing active operations. The Thomson-Houston Company write and telegraph that work on the cars is being rapidly rushed, and it is yet hoped to have cars running out to the grounds during state fair time.

Once more the Sprague Company win, and add another to their long list of new roads. Mr. W. A. Stadelman, with Messrs. Chadbourne & Hazelton, Philadelphia agents for the Sprague Electric Railway and Motor Company, has just closed a contract with the Reading & Black Bear Railroad Company of Reading, Pa., to equip their new road with the Sprague overhead system. This is to be a pleasure road running out to a hotel and park about a mile and a half through shaded woodland. They intended using steam dummies, but on visiting the Sprague Electric Railroad at Wilmington, unanimously decided to adopt that system. They will start with two 16-foot closed cars this fall. This is perhaps the first example of electric motors crowding out steam dummies on suburban roads.

Among the many orders received by the Jarvis Engineering Company of Boston from electric light and power companies to set their boilers with the Jarvis patent furnace, the following are particularly worthy of note:

Seattle Electric Railway & Power Co., Seattle, W. T.; Walla Walla Gas & Electric Light Co., Walla Walla, W. T.; Baxter Electric Motor Co., Baltimore, Md.; Hartford Electric Light Co., Hartford, Ct.; Hoosick Falls Electric Light Co., Hoosick Falls, N. Y.; Georgia Electric Light Co.' Atlanta, Ga.; Louisville Electric Light Co., Louisville, Ky.; Cambridge Electric Light Co.; Cambridge, Mass.; Pensacola Electric Light Co., Pensacola, Fla.; Virginia Electric Light & Power Co., Richmond, Va.

Within the past six months this enterprising company has sold 58 Armington & Sims engines, aggregating 5,000 horse-power.

There will be 60 cars running on the electric road in Richmond, Va., during the exposition. The road has 40 now, about 30 in constant service.

G. W. Morgan and others have petitioned the Los Angeles trustees for an electric railroad franchise, for a road from Franklin and New High streets to Pasadena.

Mr. A. A. Egbert, until recently division superintendent of the Union Pacific Railroad at Denver, has been appointed manager of the Council Bluffs & Omaha Electric Motor Railway Company.

The officials of Peoria, Ill., including Mayor John Warner and the Board of Aldermen recently visited Davenport, Iowa, inspecting the new electric road of that city. A number of Peoria's business men were also present, and the verdict was favorable to the electric road.

Electric Transmission Plant.

Although installations for the electric transmission of energy have now become a part of the usual work turned out by English, American and Continental dynamo makers, there is no country where this branch of electrical engineering has been developed to the same perfection as in Switzerland, says *Industries*, of London. Some time ago we published an account of the large electric light and power station established in Montreux, and other similar works carried out in Switzerland; and now we are enabled by the courtesy of Mr. C. E. L. Brown, the talented young engineer who is at the head of the electrical department of the Oerlikon works, to place before our readers an illustrated description of an electric transmission plant, which is probably the largest undertaking of its kind which has yet been attempted anywhere. Mr. Brown has from the first made a special study of the electric transmission of energy, and wisely eschewing any new and untried special systems, such as have led the once celebrated experiments of M. Marcel Deprez to result in utter failure, has resolved to use only the most simple and substantial types of dynamos, each machine being designed with a due regard to the work it has to perform.

The plant has been erected in Piovene, near Schio, in Upper Italy, to the order of Signor Gaetano Rossi, and serves to carry the power given off by a 250 h. p. "Victoria" turbine (American make) in the valley to a mill situated on a neighboring hill. It was partly on account of the great difference in level between the turbine house and the mill that electric transmission has been adopted, teledynamic transmission becoming very difficult when the position of the ropes deviates much from the horizontal. The total distance between generator and motor is 450 meters (nearly 500 yards), and the guaranteed commercial efficiency of the plant is 78 per cent. The illustration (Fig. 2) shows a perspective view of the generator, which is driven from the turbine shaft by a link belt, 20 inches wide, and is designed to give a current of 270 amperes at 625 volts pressure when running at 500 revolutions per minute. The motor is of similar design, but its armature contains about 8 per cent. less iron and windings. The dimensions of the various parts can be seen from the drawing, to which a scale is attached. The field magnets are entirely of cast iron, and of the four-pole type; there are four exciting coils, each containing 58 convolutions of square wire, and all the coils are coupled in series. The armature of the generator is 960mm. in diameter by 500mm. long, and is Gramme wound with 400 turns of 6mm. square wire having a sectional area of 36 sq. mm. The core of the armature consists of wrought iron discs, which are mounted upon a gun metal flanged cylinder made in two parts. The joint between the two parts is a broken line, so that even those discs which are over or close to the joint are well supported, and after the insertion of the discs the two parts of the supporting cylinder are drawn together by the bolts shown, and the outside of the flanges is insulated by wooden rings. There are four sets of brushes, two positive and two negative, diametrically opposite brushes being coupled together.

The electro-magnetic inertia in a circuit conveying 250 h. p. is necessarily very large, and on this account it would be dangerous to break the whole current suddenly. It would therefore be inadmissible to insert a fuse or other form of cut-out into the circuit, as might be done with smaller machinery, in order to save the generator from the effects of an accidental short circuit or heavy leak on the line. Any type of cut-out interrupts the current suddenly, and must therefore not be used where the self induction of the circuit is at all considerable. To overcome this difficulty, and yet protect his generator effectively, Mr. Brown in all his transmission plants employs an automatic arrangement by which the field of the generator is is demagnetized as soon as the line current exceeds a certain value. This apparatus, which is shown in Fig. 1, is an automatic circuit closer, the contacts *C C* of which are coupled to the terminals of the exciting circuit of the field magnets of the generator. The main current, before it is sent into the line, is caused to flow through the exciting coil of an electro-magnet *M* with poles *P P*, below which is pivoted an armature *A*. With the normal strength of current, the excitation of the magnet *M* is insufficient to cause attraction of the armature; but if a certain strength of current be exceeded, the armature is lifted, and liberates a catch by which the weight *W* is ordinarily held up. The weight then swings round on its arm, and with the force of a hammer jams itself between the spring contacts *C C*, thus short circuiting the field coils on the generator, which has the effect of at once lowering the E. M. F. to the very small amount due to residual magetism. In a transmission plant, where an overhead line is used, care must be taken to protect the machinery against lightning. Both generator and motor should be insulated from earth, and, in addition, some lightning protectors should be fitted. In the installation we are describing, lightning protectors are fitted at each end of the positive and negative line, but not at any intermediate point. The protector consists of a pair of metal plates with serrated edges facing each other, one plate being connected to the line and the other with an earth plate. That the electric transmission of energy has now become a most important branch of work in Switzerland and other countries where water power is abundant, will be seen from the following list of installations which have been erected, or are in course of erection, by the Oerlikon Maschinenfabrik:

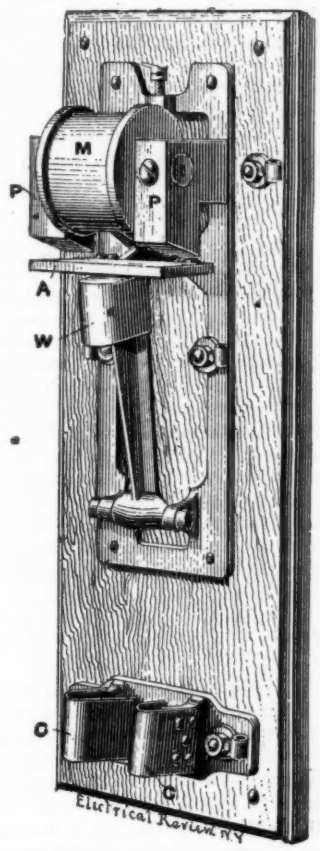


FIG 1.—CUT-OUT USED AT OERLIKON WORKS, SWITZERLAND.

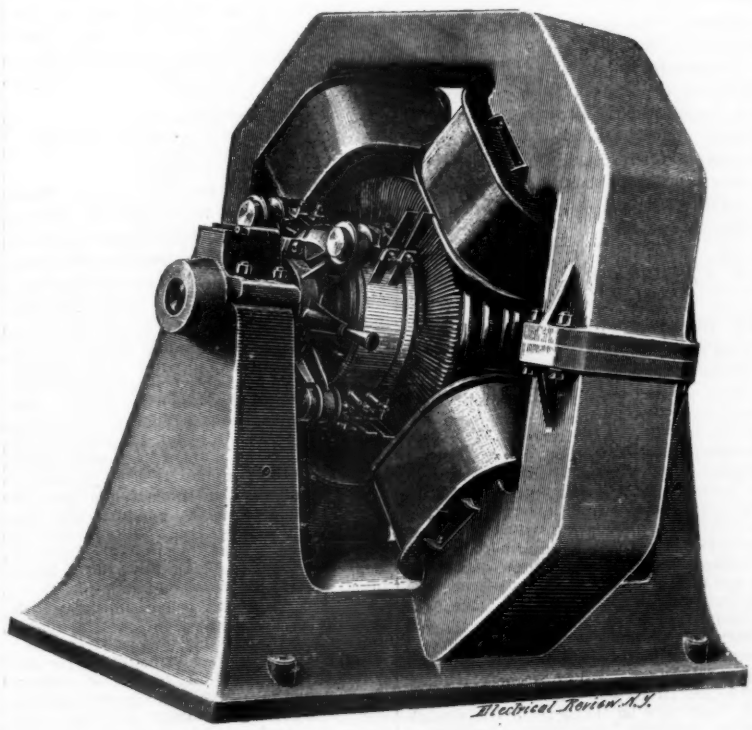


FIG. 2.—DYNAMO USED AT THE OERLIKON WORKS.

Name of Installation	Horse Power.	Distance. Meters.
J. Müller-Haßber, Solothurn	50	8,000
Gaetano Rossi, Piovene, Italy	250	450
The Worsted Yarn Mill of Derendingen, Switzerland	280	1,300
J. Amman & Wepfer, Pordenone, Italy	60	1,000
Trolier Brothers & Co., Lucerne.	120	3,000
R. & M. Frei, Aarau	15	1,000
J. & M. Legier, Diesbach, Switzerland	120	600
Paper Mills, Steyrermühl-Aichberg, Austria	100	600
C. F. Bally, Schoenenwerd, Switzerland (combined with electric lighting)	12	500
Bay & Co., Steinbach-Berne	15	1,300
J. Rauch, Mühlau, near Innsbruck	50	600

Great Increase in the Electric Motor Business—A Fine Showing by the Sprague Company.

During the past month the Sprague Electric Railway and Motor Company has put in operation a number of new electric railroads. Among these may be mentioned the Naumkeag street railway of Salem and the East Davenport street railway of Davenport, Iowa. Both of these roads are running very successfully and the president and directors of both express themselves as being very well pleased with their electrical equipments.

Work on the machinery of the electrical equipment for the West End Street Railway Company of Boston is being rapidly pushed forward at the factory and will soon be ready for installation. The overhead structure will be of the most neat and tasteful description. The poles will be of iron of some ornamental pattern and will be set in concrete. These will carry the light and small No. 6 overhead wire which is used upon all the Sprague roads. The power station will be placed at Allston on the Boston and Albany railroad, and will have both water and rail facilities for receiving fuel. The dynamos will be of the largest size and of the Edison pattern. The first part of the equipment will consist of twenty cars which will all be ready for operation by the first of October.

The Manchester and Richmond Street Railroad Company has contracted with the Sprague Company for the equipment of its ten cars by the Sprague system. This will make three roads and one hundred cars which the Sprague Company has in operation or under contract in that city alone.

It is gratifying to those interested in electrical propulsion to notice in this connection that the total operating expenses on the Richmond U. P. Railway during the last month, was only 45 per cent. of the receipts.

At St. Joseph, Mo., the successful operation of the Sprague system on the road of the Union Railway Company has been so marked that the Wyatt Park Railway Company of that city has decided to adopt Sprague motors and overhead wiring upon cars. The Union Passenger Railway Company has also contracted for an extension of the Sprague system upon its road.

Two other street railroads, now using the Sprague system over part of their roads, have decided to extend it over the whole. These are the Wilmington City Railroad Company of Wilmington, Del., and the Wilkesbarre and Suburban Railway Company of Wilkesbarre, Pa. They have both been in operation for about three months and have been giving perfect satisfaction. The first equipments of these were three and four cars respectively.

The work on the electrical equipment for the Brockton, Mass., East Side Street Railway is being pushed forward as rapidly as possible. The Sprague overhead system of wiring will be used and all the latest improvements will be adopted.

The East Cleveland Street Railway of Ohio, operating 160 cars and owning 650 horses, has, through its president, Dr. A. Everett, contracted with the Sprague Company for the electrical equipment of that important street railroad. Dr. Everett is one of the most successful and conservative street railway men in the country, and it is a fact very significant of the success which the Sprague Company has achieved in all its enterprises, that the directors of this railway company have decided to adopt its system upon their road.

The committee appointed by the City Council of Akron, Ohio, to investigate the subject of electrical railway propulsion, has advised in favor of the Sprague system. They visited every successful electrical railway in the country, and the operation of each was inspected. In the report the committee stated that they were fully satisfied from their investigations that the Sprague system was superior to all others, and consequently, the contract for equiping the road in that city has been given to the Sprague Company. The equipment will consist of 12 cars.

Among the many admirable points of the Sprague system for street railway propulsion, there may be mentioned its system of conducting current to the cars, with the impossibility of an accident on any point of the line interfering with the operation of the remainder of the road; its system of using one motor on each axle of the car, controlled by a single switch; and its method of flexibly suspending motors from the axles to secure perfection of running.

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☞ No attention will be paid to communications without the *name and address of the writer.*

We invite correspondence from Electricians, Inventors, and the Telegraph and Telephone fraternity and those engaged in Electric Lighting, on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

Timothy W. Sprague, Massachusetts Institute of Technology, is our representative at Boston, Mass.

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NEW YORK, SEPT. 1, 1888.

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New York will be full of electricity this week. Still she is never empty in this regard.

The electro-motor is to have a trial on the London Underground Railway next October; a severe test, be it said, for the trains here run on three minutes headway; the line, a circular one, being 28 miles long, and the conditions of the trial exacting. The motor is expected to carry with it accumulators capable of giving out sufficient energy for the run, and an auxiliary one to be coupled up should the main one fail. The electro-motor must indeed have done itself credit in England, to have forced its claims for favor through thick crania of the directors of the London "Underground," and, indeed, its advantages in such employment are clearly apparent.

From the shore of Staten Island, New York on a dark night looks like fairyland; a thousand electric lights dancing from out a sea of inky gloom, with here and there a cross, and there a crown, near which fireflies of huge dimensions start here and there with phosphor fires aglow; the streets a-shimmer with silver, with calcined towers lumined against the unfathomable gloom beyond. Staten Island, as you approach it, is like a mountain touched by an enchanter's wand; the electric lights about the Nero show and the docks at St. George, shining on the hill behind them, the blue and red and green fires streaming high above like a cloud of brilliant coloring.

DECISION IN AN IMPORTANT ELECTRIC LIGHT CASE.

In the United States Circuit Court, Judge Colt, on the 14th inst., rendered a decision (which we publish in full in another column) in favor of the Thomson-Houston Electric Company against the Citizens' Electric Light Company, of East Boston, Mass., users of the American lighting apparatus. The suit by the Thomson-Houston Company was brought against the Citizens' Company for use of the automatic regulator of the American Electric Manufacturing Company, which it was claimed was a direct infringement of letters patent owned by the Thomson-Houston Company. The decision in ordering an injunction against the East Boston Company would seem to expose all other companies using American apparatus to the same injunction. This decision, in addition to its commercial importance, is the first favorable one ever had by any plaintiff brought to test the validity of a patent relating to electric lighting apparatus.

HOW TO PROTECT YOUR HOUSE FROM LIGHTNING.

The question what constitutes a safe defense against lightning seems in a fair way of settlement unless the discussion should continue to the end of all things, when Gabriel blows his horn and there is no further demand for lightning rods. Up to this point it has been shown that country houses protected in the old way are not protected at all. Indeed, Mark Twain, who thought to make a funny story out of the fact that he let a dozen lightning rod men put rods on his house "so's to get rid of them," the same attracting all the lightning in the neighborhood and himself and family compelled to fly whenever a thunderstorm arose, because of them, will probably be more disappointed than pleased to learn that his house was the only correctly protected one in the neighborhood, because it takes all the point out of his story, making it no longer funny but serious. Indeed, the book must now be taken from the department of "Fiction" and put under that of "Applied Science," for Prof. Oliver Loge in a recent lecture says that is the only proper way to protect a house. Here is what he says: "A wire netting all over the house, a good earth connection to it at several points, and a plentiful supply of that barbed wire which serves so abominably well for fences, stuck all over the roof, and you have an admirable system of defense." It is a reasonable theory and doubtless a correct one, as most men will agree who have ever seen the electricity a Wimshurst machine will discharge dissipated by one and then by a half dozen points, nor is it necessary to lengthen your points and try and go up and meet a thunderbolt. Let the lightning come to you, says Prof. Loge, and if your roof is well covered with wire netting, you're all right.

WELCOME TO THE DELEGATES TO THE NATIONAL ELECTRIC LIGHT CONVENTION.

Personally known to most of those now visiting New York as delegates to the National Electric Light Convention, and knowing the others because of their work or those of the companies they represent, the staff of the ELECTRICAL REVIEW wishes to offer them, collectively and individually, a cordial and hearty welcome. Our offices and our suite of rooms at the Hotel Brunswick are open to each and everyone of them, and we shall feel highly honored to see them avail themselves freely of the invitation to use them. The Electric Club, through the recent action of its Managers, also throws wide its hospitable doors to receive them; all having accorded them the privileges of its handsome rooms and conveniences during their stay.

They will find the lighting system of our little town extensive, though by no means complete; hedged around by some little difficulties, which will not, perhaps, at the moment become clear to those unaccustomed to Metropolitan laws and lawmakers, unless they may come from such fortunate districts as possess a Mayor and Board of Electrical Control at one and the same time. They will find here electric lighting companies ordered under heavy penalties to keep their street lights aglow by one part of the city government and threatened by another part with injunction and prosecution if they do so. Thus they may fairly be likened unto a horse with bag of oats depending from a stick projecting from his nose; if he stand still, he gets no dinner, and if he runs, though it dangles nearer, and whets his appetite to the quick with promise, yet will his stomach never know their flavor.

As to lighting we have all kinds; the big voltaic arc; its cousin, the small but diffusive incandescent, the oil lamp of those who are waiting for electric lighting, the odorous gas jet and the tallow candle stuck in a black bottle which lights up Mrs. Gilhooly's humble cot hid among the fastnesses of Harlem's rocks and by which she sees to milk the goats which all day have browsed amongst the juicy herbage of the bill board and the dust heap. They will find a few other things here but want of space forbids our naming them.

Once more we bid the Delegates a hearty welcome.

AN ELECTRIC MOTOR CRITIC ANSWERED.

The Sprague electric motor people ought to be very thankful to one Robert Gillam, a resident of Kansas City, calling himself an engineer and engaged in puffing cable traction. In a communication to the Washington *Post*, Gillam, speaking of the recently completed electric street railway in Richmond, thus quotes President Smith of the Kansas City Cable Company: "Its success is due to the remarkably favorable conditions under which it is constructed. In the first place the streets are nearly level, thus giving a little power its best effect. I notice in all of their statements no mention is made of the earnings of the company, that is because so much power is lost in transmission from the stationary engine to the dynamo, that the expenses of the road nearly double that of other roads." This meeting the eye of Superintendent Geo. A. Burt, of the Richmond Electric Railway, he said:

"If Mr. Smith calls a ten and one-tenth per cent. grade 'nearly level,' will he kindly enlighten us as to his idea of an incline? Why, sir, the greatest difficulties ever encountered in the building of a street railway in the world in the matter of grades, curves, etc., have been successfully met and overcome here, and as to his assertion, and that 'the expenses of the road are nearly double that of other roads,' etc., listen to the following extract from my official report:

"The entire operating expenses chargeable at the central station for forty cars, with the present mileage, on the heaviest section of the track, is only one and a half per cent. per car mile. This includes electrician, engineers, firemen, dynamo men, all coal, oil waste, water, lighting and depreciation, the working force being, with the exception of one man, sufficient to handle fifty cars.

"The total operating expenses, including everything, during the month of May was only forty seven per cent. of the receipts."

An electric railway must be giving considerable satisfaction when its owners take up the cudgels for the builders like this.

INVENTION AND DISCOVERY.

Two words which glibly enough fall from the lips of the average man in a careless sort of indiscrimination as if they were synonymous. But there is a vast sea of distinction between them. Literally, they are not so widely separated; but they have come to represent two totally different aspects of human action. To the writer's thinking, the terms have been greatly confused.

Columbus hardly *discovered* America, he *invented* it—that is, as to its cognizable existence. He studied, figured, applied the laws as he knew them, and determined that there must be a continent there, and he plodded on till he proved the fact, and reduced his invention to practice.

Newton *discovered* the law of gravity, one might say, without either mental or physical effort. Watt invented the steam engine, and Stephenson invented the locomotive. They felt and knew the goal was ahead, but how to reach it was the question which required invention of the highest order. Eli Whitney saw the painful and laborious methods of cleaning out cotton and shredding it, intuitively felt it could be done by machinery, went to *work*, and gave the world one of his great inventions, the cotton gin. Howe's great inspiration to place the eye at the point of a needle may be said to have been a discovery. It unfolded a picture to his mind prophetic of good to almost countless millions, but *invention* had to be invoked to give the picture life, and the sewing machine in all its beauty came slowly forth from the chrysalis of Howe's discovery. The irregular lathe and the modern harvester were inventions; their dim, indefinable forms loomed up in the mists of their inventors' minds, they felt the impulse of improvement, the value of the goal gained, and they went to work, and at last succeeded, and the wood-carver and reaping-hook lost their usefulness to that extent.

The electric telegraph was never discovered; it was consistently invented. Countless devices and methods were designed, tested, thrown away—to be afterwards revivified, many of them—new appliances and systems laboriously worked out, the midnight oil unsparingly sacrificed, until at last, a perfected and practical system and apparatus were given to the world.

It is hard to say whether the dynamo was invented or discovered, considering its prototype, the magneto machine. The probabilities are it was an accidental discovery. The arc light was a discovery pure and simple. Electric incandescence was a discovery, but the incandescent lamp in its commercial form stands forth as one of the most beautiful examples of man's inventive faculty. The countless experiments on material, the bulb, the seal, the standardizing, the pumps, and all the appliances that go to provide us with the beautifully glowing luminary, all are ineradicable proofs of invention of the very highest order. Midnight oil and noonday sun, morning's vigor and evening's reposeful ruminations, were all called into requisition to complete the work. This is true invention.

The phonograph was originally a discovery, a happy thought of Edison's, but invention of a high order was necessary to produce the beautiful instrument of the present day. It was like Howe's needle, the germ was there, but the machine had to be devised to make it practicable.

The undulatory telephone was a discovery, a brilliant one, but still a discovery. A happy thought supplied the missing link in an incomplete chain, and when the weld of that link was accomplished, the whole world was enchained in admiration, the wonderful utility of the device was quickly recognized, and the discoverer reaped a rich harvest.

The pneumatic process of Bessemer was an invention of high grade and far reaching importance, and the Siemen's regenerative furnace has proved its equal in merit as a methodical and logical invention beautifully carried out.

The inventor sees his goal, and consistently strives for it. He knows the object is there and he goes energetically after it, sometimes straight to it, but oftener is many times lost

in the wilderness of deluded fancy. He sees a light ahead, sighs relief and darts after it, only to find it a will-o'-the-wisp. Undaunted, he starts again, only perhaps to meet other and worse misfortunes. But he struggles on hopefully, and at last reaches the shrine of his adoration and is for the time content.

The discoverer walks along calmly towards some goal, or lies on the roadside meditating, and happening to cast his idle eyes downwards sees a gem sparkling at his feet, and he sometimes picks it up and adds it to the galaxy of the world's diadem, but he as often fails to note the scintillations that betoken its preciousness, and spurns it back into the deeper dust to lie unseen and unknown perhaps for ages.

Which of these two promoters of the world's welfare merits the higher praise, it is needless to ask.

Manufacturing Notes.

The Hussey Re-Heater and Steam Improvement Company is arranging for a new factory site. The company needs enlarged facilities, resulting from the increased demand for their improvements.

John R. Burdick, the general western agent of the Callender Insulated Wire Company, closed a contract for 20,000 feet of cable, last week, to be used in Minneapolis. For a sample order, John commences pretty strong.

The Brush Electric Company, Cleveland, Ohio, report that their carbon business is larger than ever before. They have shipped within the last month or two eight or ten solid car loads of carbons to different portions of the country.

In engineering circles the great showing made by the Jarvis Engineering Company will be read with much interest. This company has made a pronounced success with its valuable work in electrical circles, both of lighting and power.

Mr. A. H. Patterson, manager of the Phœnix Glass Company, is always developing new artistic designs, and has won an enviable reputation for his enterprising company in this regard. In artistic glassware, incandescent and arc globes, the customer of the Phœnix is always sure to find what he wants.

C. C. Sutherland, general agent of the Brush Electric Company for the western part of New York State, has recently sold to Alfred Costello & Company, for their tannery at Costello, Pa., an incandescent electric light plant complete, consisting of a 200 incandescent dynamo with the full complement of lamps.

The great showing made by the National Pipe Bending Company, of New Haven, Conn., in relation to the use of its feed water heater by electric lighting companies is splendid evidence of the merits of the heater. Col. S. J. Fox, the president of the company, has many friends in electrical circles, and has reason to be proud of fine record made and popularity secured by this heater.

The National Carbon Company, of Cleveland, Ohio, presents to the members of the National Electric Light Association, this week, a very complete and interesting Directory of electric arc lighting plants in North America. The Directory has evidently been prepared with much care, and brings the list down to the present date. The thanks of the electric light fraternity are certainly due the National Company for this valuable gift.

The Washburn & Moen Manufacturing Company has issued its sixth edition of the "Pocket Handbook of Copper and Iron Wire in Electric Transmission." It contains much valuable and compactly arranged information. The columns of the REVIEW have, very sensibly, been largely drawn upon in this work, which the editor of the *Handbook* conscientiously credits. The wire tables are numerous, and evidently prepared with much care and ability, among them appearing a particularly interesting and valuable one, announced as condensed from the tables of the Bridgeport Brass Company, which at once gives it the stamp of reliability. This little publication will be, we presume, sent to all requesting it, and is well worth writing for.

OUR CHICAGO LETTER.

(Special Correspondence.)

The Western Department of the REVIEW regrets that it can do no better on the occasion of the semi-annual re-union than to ask a kindly remembrance on the part of the boys. Maybe we will all meet in Chicago next time.

Experiments have recently been made between St. Paul and Duluth, by P. G. Reynolds, Superintendent of Construction, W. B. Joyce, Manager of the St. Paul Telephone Company, and Superintendent Warman of Minneapolis, with long distance telephone work over telegraph wires. The results were highly satisfactory. Lines are to be constructed at once between Minneapolis, St. Paul, Chicago, Milwaukee and Duluth.

$20,000 worth of blooded horses comprised in eighteen animals was wiped out, and their owner badly stunned by a single bolt of lightning near Cheyenne, Wyo., on the 17th inst.

Marquette, Mich., had a taste of cyclonic whirligigs on the 20th. The funnel shaped dervish danced provokingly for a time above the city, by way of tantilization, then swooped down upon the business portion of the place. It passed a block on Front street, every movable thing joining in a merry waltz to its deathly hum, jumped over the buildings, chassezed to the east, then southward, and left the city by the water route, lashing the water into a perfect washing day suds.

The dance was a short one. In two minutes whole business blocks were unroofed, chimneys, telephone poles, shade trees and out-buildings were demolished, glass fronts to stores were wrecked and goods damaged by water, while to add to the confusion frightened teams broke loose and ran madly through the streets. While there were many narrow escapes, no lives were lost.

All through the South in Tennessee, Alabama, Louisiana, and East of these States, heavy electrical disturbances are reported all the way from the 18th to the 20th, and by the 22d the Cuban hurricane, as it was called, had worked its way round to Washington.

The weather bureau had arranged for the storm to take a bee line route for Lake Erie, but instead it took the wrong chute, and headed for New York, New England and Nova Scotia. Some astute signal service fellow explained the whole thing very satisfactorily, as below :

"The storm, you know, is caused by high winds blowing spirally inwards from all directions toward a low spot—that is, a spot of low barometic pressure. In the West Indies such a disturbance is called a hurricane or a cyclone. All storms have this circling, whirling characteristic, but their intensity depends upon the winds feeding them. The offshoot that shook up Washington and the country between here and Baltimore was caused by a disturbance in the direction of the winds. Such whirls are properly called tornadoes, and are the result of a wind, usually from the south, taking an erratic direction and meeting some other current."

The Chicago Telephone Company is laying a submarine cable across the Calumet river at Ninety-fifth street, in order to supply East South Chicago with telephone service.

An electrical conundrum has just come to light. What is the difference between the outside and inside lights at the ——— hotel ?

Look at the outside lights you see they are electric lights, and when you go inside they are all Israel-ites.

Recently formed corporations are : The Lowth Stetho Telephone Company of Chicago ; capital, $5,000,000 ; incorporators, James Lowth, Edwin F. Brown, Jr., and Allan C. Knapp. The People's Light and Power Company of Chicago ; capital, $100,000 ; incorporators, Charles P. H. Dose, John F. Bulmann, and Charles C. Fricke. The Edgewater Light Company, of Chicago ; capital, $60,000 ; incorporators, John Lewis Cochran, S. Wilmer Carmel, and John C. Scovel.

Fierce and furious are the struggles now going on among the wire men, the dynamo men, and all the other men connected with electric lighting, because of the new franchises recently granted by the City Council. There is no peace for the franchise owners, and around their heretofore peaceful domiciles there arises when the sun has sunk to rest a hazy blue atmosphere that reminds one of the Indian summer. It is the sulphurreted remnants of the subtle agents vaporing, made visible by the approaching darkness, and it smells—worse than Bridgeport !

Quebec and Ontario dailies of the 17th chronicle a fearful storm during the previous night, which wrecked some 20 houses around Valleyfield, Quebec, raised hob and leveled buildings about Ottawa, and was accompanied by lightning of the most intense and destructive quality everywhere.

A hotel in Montreal had its flag staff and part of a brick wall thrown down by electrical discharges, and the city gas works were set on fire by the same cause, while many people were prostrated by the shocks.

Professor Barrett and E. B. Chandler were both at the annual re-union of the National Association of Fire Engineers, at Minneapolis, last week.

There is a fair prospect of the inauguration of an electric exchange in Chicago, on something the same basis as the New England Exchange. We need it, and the proposition will receive the hearty support of all right-minded electrical workers. If a bell hanger desires to run electrical wires, he should have some sort of instruction, and if a lineman or a dynamo man wants work, somebody should be able to find out his value in such capacity before he has burned a building or ruined an armature through ignorance of his assumed calling.

Harold P. Brown, whose recent experiments have brought him prominently before the electrical community, was granted a patent on the 7th of August, for a system of combined arc and incandescent lighting, which has been the cause of much argument in the patent office since 1884.

C. C. H.

Chicago, May 25, 1888.

Personal.

Mr. Thomas A. Edison is enjoying a season of rest at Lake Chautauqua, New York, the guest of Mr. Louis Miller, of Ohio, who is the owner of a fine cottage at the Lake.

Mr. Henry Hine, the expert on electrical and fishing matters, has returned from a season of pickerel catching at the Thousand Islands, having landed boat-load after boat-load of four pounders, and several larger ones.

Mr. L. J. Hart, the active and enterprising electric light man of New Orleans, is in the city, was a visitor at the Electric Club, and will remain over for the electric light convention. He operates one of the biggest electric light plants in the country, and is thoroughly awake to the advances being made in the electrical field.

Prof. W. L. Puffer, in his spare hours for a year or more, has been building some Wheatstone bridges, of most excellent arrangement and almost absolutely correct. New features are introduced. Some large ones show a figure of merit of $\frac{1}{100}$ of one per cent., and others are in progress. His headquarters are Institute of Technology, Boston.

Mr. C. W. Robinson, the secretary of the Buffalo International Fair Association, which is to be held in that city from September 4th to the 14th, has complimented the press in a style that is artistic and attractive. The press tickets are enclosed in a very handsome Russia leather card case of the finest quality, and the case will undoubtedly be kept as a useful souvenir of the Fair Association, as well as of the considerate and ingenious secretary.

It is said that the right to use the dynamo regulator, which was the bone of contention in the suit won by the Thomson-Houston Company against the American Company, is worth $1,000 a day. Such a regulator is a very satisfactory pocket-book regulator.

The Aluminium Brass and Bronze Company of Waterbury will locate in Bridgeport, Conn. The company has bought land in the latter place and will establish a big plant. The company has a capital stock of $250,000. Dr. Leonard Waldo is the scientific man of the company, and a good man he is.

Electricity's Apostles.

(*Continued from page* 1.)

commodation was secured for all at the hotel selected, and has come as near success in this respect as was possible. Every room that could be secured has been engaged or is now occupied, and several large delegations are expected to arrive Wednesday morning. The Chicago delegation, excepting those already on the ground, is expected on a special car at that time, and these enterprising western members are coming, it is said, to present the claims of Chicago as the next place of meeting.

THE PROGRAMME.

In addition to the papers announced in the REVIEW last week the following papers are to be presented :

P. H. Van der Weyde, on "The Alternating Current."

S. S. Leonard, on "Petroleum Fuel."

A. C. Chenoweth, on "An Underground Conduit."

The convention will assemble at the Hotel Brunswick on Fifth avenue and 26th and 27th streets, at 12 o'clock Wednesday, President S. A. Duncan to preside,

Mayor Abram S. Hewitt has promised to be present, unless prevented by the illness of a near relative, and will welcome the delegates.

After general announcements have been made, the reading of papers and discussion will follow.

Wednesday evening the Association has been invited by an electrical paper of New York to attend that famous open air spectacle, "Nero, or the Fall of Rome," to which tickets will be provided for all attendants.

Thursday evening, the Okonite Company has invited the Association to attend, as its guests, the popular opera of "The Queen's Mate," at the Broadway Theatre. Seats and boxes have been reserved and a collation at the Electric Club will be served afterwards.

It is expected that the Association will adjoin early Friday afternoon, and many of its members attend the Clam bake of the American Electrical Works at Providence on Saturday.

ALREADY REPORTED.

The electrical workers and seekers after information in this field are arriving each day. Among those already present from out of town are S. A. Duncan (and wife), of Pittsburgh ; J. F. Morrison (and wife), of Baltimore ; Dr. A. V. Garrett (and wife), of Boston ; L. J. Hart, New Orleans ; R. T. McDonald and M. M. M. Slattery, Fort Wayne ; R. F. Ross, Boston, B. E. Sunny, J. J. Nate, C. F. Clarke, Chicago ; H. M. Linnell, Hartford ; Col. Geo. L. Beetle, Chicago ; E. F. Peck, Brooklyn ; Fred. W. Royce, Washington ; D. R. Russell, St. Louis ; Geo. F. Porter, Philadelphia ; H. A. Cleverly, Philadelphia ; Chas. L. Ireson, Boston ; T. C. Smith, Philadelphia ; W. H. Harding and Norman McCarty, Baltimore ; T. W. Sprague, Boston ; Chas. A. Brown, Chicago ; E. R. Weeks, Kansas City.

—— The Brush Electric Light Company, of Buffalo, N. Y., are increasing their electric light plant. They have recently ordered from the Brush Electric Company, of Cleveland, Ohio, two 65 light 2,000 c. p. dynamos with lamps. This company is now burning, including the above dynamos, 1,300 arc lamps and a large number of idcandescent.

—— The question of lighting Prospect Park, Brooklyn, by electricity is being discussed by the Park Board. Mr. C. J. Field, chief engineer of the Edison United Manufacturing Company, has submitted a proposition to the Board showing that it will cost the city about $60,000 to run the plant, and the corporation counsel has been requested to state if any of the $200,000 appropriated for permanent improvement can be used for this purpose.

The Sprague Company has already begun work in equipping West End cars which are destined to run on the Beacon street electric railway. The road will be in operation the latter end of September, or the first of October.

TELEGRAPHIC

.... The new Gray Telautograph Company is arranging its organization with a view to actively prosecuting business. The next meeting will be held at Alexandria, Va.

.... New Orleans seems to be having a rather tough time in the way of electrical troubles. The fire alarm station in the sixth district, which is separated from the rest of the city, was entirely cleaned up the other day by an electric light current which got away from "proper control."

.... The Old Time Telegraphers, at their Chicago meeting, elected the following officers for the ensuing year: President, Charles E. Taylor, of Louisville, Ky.; vice-president, D. K. Smith, of Kansas City, Mo.; secretary and treasurer, W. J. Dealy, of New York. The next re-union will be held at Louisville, on the second Monday in September, 1889.

... The Chicago Electric Club is taking a vacation during the rest of the summer so far as papers and discussions are concerned, save the discussions which occur over the *menu* and the billiard tables. At the last meeting of the Club a committee was appointed to look for a better suite of rooms elsewhere, on account of several of the members having complained of the surroundings.

The Broadway Electric Railway, St. Louis, Mo.

The plan of the St. Louis Street Railway Company for an experimental electric railway at the end of their line has been approved by the Board of Public Improvement, and a permit to run it for nine months granted by the mayor. The following is a brief description of the construction:

The electric railway to be built at the end of the Broadway line will consist in the street construction of ornamental iron supports for the conductors. The lower portion of the iron post will be four inches in diameter, made of strong gas pipe set in the ground five feet with cement and broken stone. The upper portion of the pole is made of three-inch gas pipe ornamented at its top with an arch and arm, to which the cross cable is attached. This pole or arch will be painted a dark slate color, with two coats of paint, and all the castings will be made of malleable iron, thus preventing the possibility of breakage. The cross cable is insulated from this pole and the wires are in turn insulated from the cross cable with special insulators for the purpose. Should a wire become grounded on this cross cable and in turn the cable be grounded on the post or iron support, no shock could be obtained from the pole, as it will be thoroughly grounded.

The iron supports for the wires shall be set erect and be of double strength, sufficient to carry the weight upon them; they will be placed at intervals of from 125 to 150 feet.

The conductors shall consist of two one-fourth inch hard drawn silicon bronze wires four inches apart over each track, and shall not be lower than 18 feet above the rail. The conductors or any part of the circuit shall not be connected with the earth or the rails of the track, but all shall be perfectly insulated. The lightness of the overhead construction will make it very inconspicuous and scarcely noticeable, and at the same time it is made of such materials as shall make it exceedingly strong. Should one of the conductors fall to the earth from any accident, or should the telegraph or telephone wire fall over them, and be in contact with them, they may be picked up without injury.

The cars to be operated on this line will be much like the ordinary grip car on the cable roads, each being provided with two powerful motors, which will overcome any load which may be put on them with any condition of track. These cars may be stopped with great suddenness by applying the brake and reversing the motor. A lifeguard will be provided on each motor to prevent people from getting under the wheels in case of accident. Electric headlights will be put on the motors to light the track during the night. The speed may be regulated at the will of the operator. Each motor will be capable of drawing from one to two loaded coaches in a train.

The Electric Light Currents in Relation to Firemen's Work.

[At the annual re-union of the National Association of Fire Chief Engineers, Prof. J. P. Barrett, of Chicago, read a paper on electric light currents, of which the following is the substance.—EDS. REVIEW.]

The danger arising from the use of electricity as a source of light and power are two-fold; and both forms are of a nature to deeply interest the fire brigade. In the one instance it is a matter of conflagration, one more cause for an alarm, with its possible attendant dangers, while fighting a plain fire; and in the other, a matter of more serious personal interest to the individual from contact with conductors, directly or indirectly, over which a dangerous current may be flowing.

At the risk of twice telling a tale, I may be permitted to state that electric light currents are radically different when used for different forms of lighting. These differences are differences of degree, either in pressure or quantity, and the one form cannot be used for the other variety of illumination.

That is, the current required for an arc lamp, such as you see on the street, in which the carbon consumes and is daily replaced, cannot be utilized for one of the smaller lamps, save as the current is modified by the use of smaller wire. And the current used in the glow or incandescent lamps, the small lamps, in which the light is in the form of a loop in a small globe, cannot in a general way be utilized for the former, the arc lamp.

While there are some slight variations to this general rule, these are not of a nature to affect the illustration, and are not essential here.

The first, or arc light current is one in which high pressure, or as we call it high potential is a necessity. The quantity of current flowing is low but comparatively constant, but the pressure is variable, depending on the work to be done by the current. By work I mean the number of lamps, or motors, or plating machines, or any other application of power. Electricity must be looked on as a force or power, like heat.

The second, or incandescent form of current is one in which the pressure remains comparatively constant, while the quantity generated by the machine is increased with every additional lamp placed in the line.

These are the two most generally used forms of current, and in both of these the current effects are constant in direction—what is known, as current flow, is assumed to be from the positive side of the generator to the line, through the lamps and back to the dynamo.

A recently introduced form of generator is being installed in many cities of the Union which is known as an alternate current machine and system. In this form the current generated at the machine is of the high pressure variety, but is of an alternate character. The impulses instead of being headed all in one direction, are reversed, are vibratory in their character, like the strokes of a pump. This current is carried by a comparatively small wire to the point where it is wished to utilize it for lighting, and here it is taken into, and run through what is known as a converter or transformer which consists of a coil of this wire, as thoroughly insulated as possible from both the iron box, and a second coil lying next to the first.

You have all heard of induction. Here is a good place to show what induction means. These two coils lying next each other, but so separated electrically by insulation that no current can pass from either to the other—these two coils have currents. The first one receives its current from the generator—but the second? This has a current, and this current is an induced current a current produced by the influence at a distance both positive and electrical from it, without contact.

Now, if the generator sent out a perfectly steady current instead of an alternating current this transformer would fail of its purpose, because induction is an action which only shows itself in the secondary or induced coil, at the closing or opening of the primary or inducing coil current.

My object in going into all this detail is to give you all a little inside information, so when one of these electrical experts comes along with a new system that he tells you is perfectly safe to board and sleep and play with, you will not be entirely at his mercy.

Well, to go back to the converter. The secondary wire by a difference in its size from the primary, exhibits a different form of current. The chief characteristic of the primary current is pressure, with very little quantity. In the secondary we have much quantity, with very little pressure.

If we multiply the pressure by the quantity, we shall find the result the same in both cases, save what is lost by the converting process.

Now this secondary current is also alternate like the primary, but it is of low pressure and large quantity, and so it is used for incandescent lighting. Just now it is not used much for power, but it will be, by and by.

We have now three forms of electrical currents which are used for light or power. 1st. The arc direct current of constant quantity. The 2d is the incandescent direct current of constant pressure. 3d. The incandescent alternate or induced current.

Each of these forms of current has its own peculiarities, each is capable of doing harm in its own individual way, and each requires to be watched and guarded against from a different standpoint.

First. All wires, especially electric light conductors, should be placed underground, because of freedom from all interruptions, atmospheric and mechanical. Improvements in underground methods and insulation render a true economy as well as a method of safety.

If this suggestion is ignored, and poles are permitted, good insulation is the chief and principal necessity, and one which is, unfortunately, too often ignored by the electric light men.

I want to say right here, not because I am in danger of forgetting it, but because it is a good place for it, that you will all do well to keep your eyes on wires which are cotton-covered and then painted with common paint. The electric light man will tell you it's underwriter's wire, and therefore good—tell him you have heard it called undertaker's wire—he will tell you it is asbestos painted—contradict him and make him prove it—he will tell you it is weatherproof—tell him Barrett says it is not, and make him put up a decent wire out of doors, something that with the first rain will not water-soak and endanger the life of everybody who stumbles over it, or the property it happens to swing against. An arc light line should not be allowed to approach nearer than seven feet in crossing a roof, should never be permitted to come near enough to interfere with a fireman or any one on a fire escape, and if on poles, should be run so as to reduce, as far as possible, the chances of its interference with other wires. At all points where it enters or leaves buildings, it should do so through an extra insulation, and this last should be slanted downward on the outside to prevent rain from running in along the wire. Perhaps as good an insulator for this purpose as any is a piece of hard rubber tubing, which should fit the hole tight so as not to slip.

You want to keep water away from electricity, for the tendency is to escape wherever there is dampness, water, if not pure, being a good conductor of the electrical current.

If all electric lines could be kept from ground contacts, that is, contacts more or less perfect to the earth, they wouldn't do so much mischief. To keep them thus insulated is the great problem of to-day. When a piece of poor wire lies on a tin roof, and there comes up a shower, the tin and the wet walls, and the conductor pipe and all, taken together, form what we call an earth or ground connection. Now, with only this one bad spot on a line, no harm is done. But suppose in the next block the wire touches an awning frame; when that rain comes up the awning is apt to take fire, and when the young man comes out of the store to poke away the wire with a wet stick, he makes a third ground, and has his feelings hurt for trying to do a good deed. This is one of those cases where water will make fire, and in all cases, it is a second ground, or rather two grounds, which result in mischief.

Prevention is always better than cure, and if a line is properly constructed, and these little points looked after in the commencement, much time, labor and worry is avoided in the future.

The forte of the arc light current is pressure, which means capacity for destruction.

In the second form of current, where quantity is its vital necessity, the power to kill is nothing so potent, because of the low pressure employed. But it has its little peculiarity as well as the former variety of current.

And right here I must explain a little again, to make myself better understood. If you draw a match on a board, (most of you don't, but if you should) the mechanical force you use is converted into heat, and the match takes fire. You say the friction did it—that is, something that opposed the mechanical force you applied—a resistance converted the power into heat.

In electricity there can be just such an opposition to the electrical flow (we call it resistance), and the result is precisely the same—heat is developed.

When, in my mind, I set the awning afire a moment ago, I did it by this same resistance. A wet awning is not as good a conductor as a copper wire, and so, while it carried off a certain amount of current, part of this force was turned into heat, and set the cloth on fire.

A current like that in use for the small form of electric lamp, the incandescent lamp, has far more quantity of current, and consequently needs larger wires to carry it, but because of its low pressure characteristic it is not so liable to get away from its proper channel. When it does so get away, however, then, meeting with resistance, heat and fire may follow.

We have a safeguard for this, aside from high insulation. One form of metal will carry an electrical current more readily than another, just as a glass tube will carry water more readily than a rough-bored wooden one—it is smoother. So we calculate on the size of wire necessary to carry the required amount of current without unduly heating, and then put into that line a piece of another metal, which will not carry the current as readily as the copper, and when an increase of current heats the copper, it melts the other metal, and opens the line.

So you see the two systems depend for safety upon two different methods, and what is proper in the one case may be improper or impracticable in the other.

The third form or system combines the two—high and low pressure systems, and both forms of protection are required—one on either side of the converter or transformer. So long as the insulation between the two coils in that box remains perfect these two forms of protection are complete, each for its own system. Should the two wires, primary and secondary, in the transformer become crossed or make contact outside the box, neither portion of the line would be protected.

The greatest danger, as I look at it, is from contacts with telegraph, telephone and dead wires. Telegraph, telephone, and old disused wires are all at one or both ends in contact with ground. If the electric light line is already grounded, even imperfectly or partially, and it then crosses one of the above conductors, why the current will divide between the line proper and the earth which forms a second path between the two contacts. Now, suppose two such wires are imperfectly crossed by an electric light wire, one of these to the right and the other to the left of the center, the two contacts may be sufficient to quietly carry all the current to ground. But let somebody pick up one of those wires, he becomes the conductor in place of the wire, at the point where he takes hold of it, and from there to ground. The quantity of current which he is made to

carry may be very small, but the pressure behind it may be enough to kill even a fireman.

Still, while the incandescent form of current is most likely to turn in an alarm, there is also danger from fire from the arc current, for wherever and whenever electricity is obstructed in its flow, the current is changed from its original form and shows itself as heat, just as friction produces heat.

It is far easier to show how fire or other damage may occur through electricity than it is to say how we can under all circumstances prevent these troubles.

Where there is a man in charge of the fire alarm telegraph he should have authority to inspect and determine what is necessary to make a plant safe. Well, some of you will say, "but we have no fire alarm, therefore no superintendent of telegraph." These cases are rare, and will naturally follow in the wake of more progressive cities. Others will say "our superintendent has not had sufficient experience to justify his assignment to such a responsible duty." If that is so, and I presume it is, the managers or heads of the fire department are solely to blame for it. I am free to say there are isolated cases where the gentlemen in charge of fire telegraph systems are not as fully versed in electrical knowledge as they should be, and I find it the case that there is not sufficient attention paid to the selection of a head for that department.

In the selection of engineers, drivers, stokers, etc., particular care is taken to make proper choice, after rigid examination as to ability. But in the telegraph department, promotion is awarded some employé who has climbed a pole, cleaned a battery, or joined a wire. This seems to be considered sufficient to render him competent. I think promotions of this character should be made from the fire department ranks, and especial attention should be paid to the capacity of the candidate to excel in his profession. All reasonable opportunity should be given him to acquire information which will be of use to him in the capacity he is to assume. The telegraph arm of the service is the all important one. You will all admit the justice of these criticisms. He should be admitted at your conventions, and should be conversant with, or at least have a fair knowledge, all branches of the telegraphic profession. In short, he should be your authority and the referee in all electrical matters which may arise among your citizens.

I think there would be as much reason in asking an outside party for information in fire matters, when you have an organized department, as to employ an outside expert to tell you what you need in electric lighting, when you have a superintendent of telegraph in your own department.

One of two things you are coming to. You will have electric lights and electric wires in your midst everywhere. You cannot and you do not want to prevent them.

But we must make up our minds to either take the lines and fixtures as they are placed and with these the risk of trouble, or we must see to it that the work is properly done and properly run when finished.

One word about power lines. While a motor on an arc circuit consumes no more energy than a lamp, still it is different from a lamp in this one respect. It is used for power purposes to run a printing press or a fan, or something, and has to be stopped and started, perhaps many times a day. Each employé in the establishment in turn takes a hand at it, and by and by feels that it is safe to do a little experimenting on his own hook, and he takes risks which would make an old electrician shudder. An electric lamp, on the contrary, is hung up, generally out of reach, and is lighted and extinguished from the station. There is no excuse for monkeying with it.

A motor may be run by either an arc light or an incandescent light current, but either one should be protected as carefully as, if not more carefully than, an arc lamp. They look well fenced in, with a large sized danger notice close by.

The insurance people are the firemen's best friends in all this matter. I would suggest to the chief to make it his business to talk this matter down with the insurance agents, and I feel sure that good may be brought out of such a conference. They are interested, and while insurance rates are less in some portions of New England, where electric light has displaced gas, these lower rates cannot be obtained except on the certificate of an inspector, and I am satisfied that this view of the subject is rapidly spreading among the sensible insurance people. Is it not reasonable, then, that these gentlemen will aid in this matter, as they are ever ready to aid in carrying out a good suggestion from a practical fireman.

"C. C. H." on His Vacation.

Manistee, Michigan, is a salt and lumber city, lying upon Lake Michigan, and upon an inland lake which forms a harbor by its connecting river emptying into the former water. The smaller lake (Manistee) has on every side, and at almost every available point, either a lumber mill, or a combined lumber and salt block, this last being the local name for one or more wells and apparatus for converting the brine, which is pumped up, into salt.

These wells are half a mile and upward in depth, and are put down at a cost of about $10,000. The drill, at the depth named, strikes a solid bed of rock salt, and to get this to the surface it is first converted into brine. The tubing of the well is double—one tube within another, the outer having openings through which water enters, and the inner one perfectly tight, up through which the brine is pumped to be evaporated.

The first process consists in settling the brine to remove the gypsum, which is found in floating crystals throughout the brine. Tubes in the settling vats are heated by steam, and these crystals burst and sink by their gravity. The brine is then pumped into large vats, and evaporated by steam pipes, or by a vacuum process. In the former case, the wet salt is shoveled up on platforms to drain. In the latter, the salt is constantly removed by carriers like grain elevators.

Experiments are about to be made with a Maxim dynamo connected to the outside of the vacuum pans and the inner brine, to subject the brine to the action of an electric current. From what I could learn, there was a sort of blind groping, a desire to have some electricity about it for some purpose, in the hope that something would come out of it. The suggestion was made that probably electrolytic action would discolor the salt, but the experiments are to go on.

It was a case something like that of a traveler who, while at a railroad station one very cold day, saw an emigrant lean up sideways and take a mince pie from under himself. The gentleman said he always regretted that he was unable to understand Russian, for he would have to go down to his grave without knowing whether the fellow had been sitting on that pie to thin it, or to warm it.

Various electric light systems are known to the good people of Manistee. In arc lights, they have Brush and the Indianapolis Jenney. The Edison is there, and the Indianapolis Jenney for incandescent, and there is the United States alternate system, with about 500 incandescent burners, distributed through the business part of the city. This last plant is the property of the gas company.

Ludington, south of Manistee, another lumber and salt town, is well lighted by electricity. I did not learn the systems used.

One of the most showy plants I ever remembered to have seen in regular service, I saw at Macinac Island. This island is a kind of a stone bump or wart, with little but woods (but these are beautiful), and people whose principal business seems to be to get some one else's money for as little consideration as possible. They have to crowd a whole season into two months, July and August, and then move to some more habitable clime. Macinac is one of those places where they enjoy ten months hard winter weather and have two months very late in the fall.

Crossing from the city of Macinac to the island one is struck by a group of lights, high above the shore line, which in a calm night are reflected in the water of the straits. In the gentle ripple of a light breeze the broken reflections multiply and dance like jewels in the necklace of a fairy queen.

The plant is an advertisement of Plank's Grand Hotel, and includes both arc and incandescent lights—the former outside—the latter within. As the hotel is situated, it looks from the water by day as if it were glued on to the side of the wart, and much reminds one of the Arizona cliff dwellers airy residences, albeit the Grand is a wonderfully pretty appearing and might be called a high priced hotel, if the season was only about ninety days longer.

Mackinaw, Mich., Aug. 4, '88.

One Hundred and Thirty-two Million "Surplus" in the Treasury of the United States.

The well-known banking house of Harvey Fisk & Sons, No. 28 Nassau street, has issued, under date of August 23d, the following pertinent and interesting statement, relating to our finances:

The last statement issued by James W. Hyatt, Treasurer of the United States, under date of July 31, 1888, gives the "surplus" then in his hands as treasurer, including the fractional silver coin, as $132,517,751.55. In addition to this amount, by the same statement, he held:

$9,064,830.53 to cover accrued interest on bonds.
$43,607,795.30 to meet "Disbursing Officer's balances," &c., &c.
$96,740,339.38 "for redemption of notes of National Banks failed," &c.
$100,000,000 "reserve for redemption of United States Notes."

In short, the Treasurer of the United States had in his custody on that date, in money, $732,775,527.76, against which had been issued gold, silver and legal tender certificates to the amount of $350,844,791, leaving $381,930,736.76 in his hands, of which $132,500,000 is clear "surplus." This does not seem right, especially as the United States Government had outstanding on that date $1,014,138,142 interest-bearing debt, on over a thousand millions of which it is paying interest at four to six per cent. per annum.

The Secretary of the Treasury has full authority in his hands, under Acts of Congress, to purchase of these interest-bearing bonds—and stop the interest running longer on all so purchased—up to the extent of the "surplus."

Plenty of bonds can be had to save the Government two per cent. per annum for the years they may have to run.

Since the Secretary of the Treasury commenced to purchase with the surplus money in April last, he has, by official statements from the department at Washington, purchased up to August 21st, $33,601,150 fours and four-and-a-halfs, on which he has made a saving to the people in future interest payments upwards of $12,000,000, and this after allowing for all premiums paid; and with the surplus money now in the treasury, he could save the people, in addition, $40,000,000 more of future interest payments, and take this "great peril" and menace to every interest in the country out of the calculation of business.

The enormous crops of the land now just beginning to move, the cotton crop of the South on which we depend so much to pay the balance of foreign trade—all these interests demand that they shall not be imperilled by lack of action on the part of the Administration.

The spirit of the law authorizing the Secretary to purchase bonds, is clear and unmistakable, that whenever a "surplus" accumulates over the $100,000,000 reserve to be held against the greenbacks, it shall be used, above a fair working balance, to decrease the debt by purchasing bonds at the market price; that "surplus" is now $132,500,000 over the greenback reserve. The Secretary has saved the people, as stated above, about $12,000,000 on his purchases so far; therefore there is every good reason why, as long as he can get bonds, he should increase this saving, decrease the interest-bearing debt, comply with the spirit of the law and take this "great peril" of a large "surplus" from the business of the country.

The four per cent. bonds now have 19 years to run; two per cent. per annum for each year they have to run would be 38 per cent. If the bonds should run to maturity each bond of $1,000 would cost the Government 176 per cent., or $1,760. To save two per cent. per annum the government could pay up to 138 per cent. or $1,380 for each bond; but millions could be purchased at and under 130 per cent. or $1,300 for each bond. The "four-and-a-halfs," to save two per cent. per annum, would have to be bought at not over 108⅝ per cent.; it might be very difficult to secure many millions at a better price than to save the government five per cent. gross for the short time they have to run. The "currency sixes," not yet included in Government purchases, could be had in fair quantities to net the Government over 2¼ per cent. saving for each year they have to run.

Therefore, as large dealers in Government bonds, we do not hesitate to give our opinion that the Government should invest the whole surplus of $132,500,000 to save on the average two per cent. for each year the bonds have to run, and this is exactly two per cent. per annum better than the Government is getting on its large balances lying in the treasury and national banks drawing no interest.

The evils of a "surplus" are best corrected by not having any. The present "surplus" and its evils can, in a very few months, be all done away with by using it to reduce—at the best price the bonds can be purchased—the interest bearing debt; much to the saving and comfort of the people. After this fiscal year, judging from the temper of both political parties, there will not be much "surplus," after providing for the sinking fund, to trouble the business of the country.

Truly, HARVEY FISK & SONS,
Bankers and Dealers in Government Bonds.

Telephonic News

*** A telephone line is to be put up extending from Paducah, Ky., to Boston and Smithtown.

*** A company of western men, with Hamilton S. Wicks, of Kansas City, at their head, has secured a contract with the syndicate controlling the phonograph-graphophone for all rights within the territory west of the Mississippi and east of the Rocky Mountains. Exchanges are to be established and the instruments introduced in the leading cities of that district by the 1st of October.

*** The aldermen of Detroit recently investigated the merits of the suburban electric road which runs to Grosse Pointe, and returned convinced that it was the coming street car power. Mr. W. A. Jackson and Mr. Frank E. Snow did the honors of the trip, and saw that the visitors had a pleasant visit at the Grosse Pointe Club House. This road is succeeding finely, and Detroiters want one like it in the city.

*** The Dayton, Ohio, telephone exchange burn-out was not so complete as at first reported. Only about 250 drop coils were burned out, instead of 600. The trouble arose through bad line work, a guy wire coming in contact with the trolley of the Sprague railway. Two sections of switchboard were ruined, and a dozen or so of subscribers' bells. The exchange was running again all right in a little over five hours.

*** The Bell Telephone Company of St. Louis continues its war against parties using private telephones that have been ruled infringements on its patents, says the *Globe-Democrat*. On behalf of the local company, Messrs. Hitchcock, Madil & Finkelnburg yesterday filed injunction suits against Thomas J. Lynam and Peter Lynam, composing the firm of Lynam Bros., and the A. B. Mayer Manufacturing Company. Both concerns have private lines connected with their places of business, which the telephone company contends they have no legal right to maintain. In its petition the company refers to decisions under which it claims that the 'phones used by the defendants are infringements. The petitions were filed in the office of the Clerk of the United States Circuit Court.

*** The extension of the bridge telephone system to the piers was completed one day last week, in Chicago, when the city placed a lookout at the main lighthouse to sight all incoming vessels and report their arrival to the vessel-despatcher. Although the movement of craft in the river was light Capt. Weckler found the lookout's early reports of good service in bunching boats at Rush street without unnecessarily long waits to the first comers. The lookout has had convenient quarters arranged for him which command a view of 10 miles lakeward. The disrect result of this extension of the telephone system will be to save half a dozen or more swings a day of the bridges on the main river and at the same time lessen the complaints of vessel-men that their boats are held uselessly at Rush street when there is no chance of bunching other craft with them for hours.

Telephone Time in Chicago.

Mr. James Angle, of Chicago, writes to the *Tribune* of that city as follows:

"I believe I am one of many hundred patrons of the telephone company who would be sorry if Dr. E. M. Hale's complaint of the annoyance he suffers from the time record on the telephone should result in having it stopped. To me it is nearly as great a convenience as the telephone itself; and to those business men living in the suburbs and depending on the correctness of their timepieces to 'make their trains,' it is of great value to be able to verify their watches every day. If Dr. Hale kicks at the telephone service as at present administered, I wonder he did not commit suicide about three months ago."

The American Association for the Advancement of Science.

A REVIEW OF THE CLEVELAND MEETING AND ITS ELECTRICAL WORK BY OUR STAFF CORRESPONDENT.

Among the papers read before the sections upon matters pertaining to electricity, mention may be made of "Experiments on the Direction and Velocity of the Electric Current," by Prof. E. L. Nichols and Wm. S. Franklin, both of Cornell University, Ithaca, N. Y.

A coil of wire of 390 turns was driven at a very high rate of speed, the axis of the coil being the axis of rotation. When the coil reached 338 revolutions per second, the linear velocity of the wire in the direction of its own length amounted to 8,000 centimeters per second. By means of two brush contacts at the axis, a current was sent through the coil while the latter was in motion. The magnetic moment of the coil was determined by means of a very sensitive astatic pair of magnets carrying a mirror.

Readings were taken with the coil at rest and in revolution, the motion of the coil and the direction of the current being repeatedly reversed. If the electric current result from the flow of a fluid through the wire, in other words, if it may be considered as possessing direction and finite velocity, the influence of a motion of the conductor, with or against the current, should produce an appreciable influence upon the deflection of a magnet needle, even though the velocity of the current were very large as compared with that of the conductor. In order to render the detection of this presumably very small effect less difficult, the direct influence of the coil was eliminated by differential winding. Under these circumstances, when the coil was carrying as large a current as it could be made to do without injurious heating, the rotation of the coil was found to be without appreciable effect upon the magnetic moment of the same. The best results were obtained by sending 4.6 amperes of alternating current of 40,000 alternations per minute through the coil.

At a velocity of the wire equal to 8,000 centimeters per second, they produced no effect upon the needle amounting 0.2 millimeters deflection. The figure of merit of the coil and needle was determined by substituting a coil of continuous winding, its position with respect to the needle being the same as that of the rotating coil, and determining the current necessary to produce one centimeter deflection. The sensitiveness of the apparatus was found to be such that a current having direction and a velocity of 1,000,000,000 meters per second would have shown a change in its action upon the needle (when the motion of the coil was 380 revolutions, 8,000 centimeters per second), amounting to 0.1 centimeter deflection, an effect which could not have escaped observation. It follows from the above negative result that if the electric current consists in the flow of a medium or fluid through the conductor, the velocity of the same must be greater than the exceedingly high rate just mentioned. Fopl, who in some recent experiments (Weidemann's Annalen, 1886), used an apparatus in most essential particulars similar to our own, but one by means of which only relatively very low velocities could have been detected, has reached the same negative conclusion.

The same gentlemen also read a very interesting paper on "Spectro Photometric Comparison of Artificial Illuminants."

The spectra of various sources of light were compared with the spectrum of an incandescent lamp taken as a standard. The following lights were taken:

(1) A standard candle, (2) a petroleum lamp flame without central draft, (3) a petroleum lamp flame with central draft, (4) a "Batswing" gas flame, (5) a "Board of Trade" gas flame, (6) an electric lamp of high voltage measured at five different degrees of incandescence—4, 10, 16, 22 and 28 candles, (7) an incandescent lamp of low voltage and large current measured at its normal candle-power, (8) a lime light, (9) an arc light (long arc), (10) an arc light (short arc), (11) daylight by heavily clouded sky, (12) daylight by unclouded sky.

Professor Ernest Merritt, of Ithaca, N.Y., read an interesting paper on "Incandescent Lamps Considered as Machines for Transforming Electrical Energy into the Energy of Light." In the paper the author determines the efficiency of an incandescent lamp considered as a light making machine. That is to say, the ratio of energy given off in the form of light to the total energy used. This efficiency is found to be very small compared with that of other machines. For 16 candle-power lamps it varies from four to six per cent. If an incandescent lamp could be made perfectly efficient it would therefore give the same amount of light at less than one-tenth the present cost. The quality of the light from different lamps and from the same lamp under different circumstances, is found to vary. In some cases a much greater amount of energy is needed to make the same impression in the eye. The experiments on which the paper is based were made in the laboratory of Cornell university and will be continued.

"The Protection of Watches against Magnetism," by C. J. H. Woodbury of Boston, gave the results of investigations on the subject, and which was printed in the ELECTRICAL REVIEW, August 25th.

Prof. J. W. Moor, of La Fayette College, gave accounts of two strokes of lightning where objects of little prominence in the landscape were struck by lightning.

In a short paper on a novel form of an electro-magnetic telephone, Professor R. B. Fulton, of the University of Mississippi, gave a description of a form of electro-magnetic telephone of his own device in which the ordinary spool electro-magnet and circular diaphragm are replaced by a magnetized tube of thin sheet iron, with the indulated wire wound around the tube. The tube has a rectangular cross section about two inches square (may be of any length) and open at one or both ends. It is magnetized by steel magnets, or a current, so as to have the lines of force running parallel to its length. The wire is coiled around those parts of the tube which form vibrating segments when vocal or other sounds are made near an open end of the tube. The lines of magnetic force, the direction of the vibratory motion of the walls of the tube and the direction of the induced currents are thus each at right angles to the other two. The instrument may be used either as a receiver or transmitter, but seems to work best as a transmitter to a bell receiver.

In the section of Mechanical Science and Engineering the papers were few in number, although several of them were of great interest and importance. Among the first may be mentioned the one upon the influence of aluminum upon cast iron, by W. J. Keep, C. E., superintendent of the Michigan Stone Company.

Mr. Keep illustrated his paper by a series of diagrams, picturing the effects of various percentages of aluminum in a large number of tests, and also by a full set of the test bars themselves. Very briefly the remarkable results presented in the paper are recounted:

First—The solidity of castings, and the prevention of blow holes. It is almost impossible to get a solid casting from white iron, but apparently sound castings of white iron resisted a weight of 379 pounds; with $\frac{1}{10}$ of 1 per cent. of aluminum added the strength was increased 44 per cent. The secret of the strength is in the compactness of the grain.

Second—Does the aluminum remain in the iron to exert an influence when the iron is remelted? To determine this, a series of six heats was made with the white iron, to the first of which was added $\frac{1}{4}$ of 1 per cent. of aluminum. This amount increases its resistance to weight 20 per cent., and impact 70 per cent. To each subsequent heat, portions of the original white iron were added to bring down the percentage of aluminum. The strength, due to the original aluminum addition, was apparent in all the six meltings. In further tests he added to the first heat $\frac{1}{4}$ of one per cent. of aluminum, and a like amount at each subsequent heat, the result showing conclusively that the bars contain $\frac{1}{4}$, $\frac{1}{2}$, and $\frac{3}{4}$ per cent., as was intended. It was therefore proved that the alnminum remained in the metal.

Third - The effect of the aluminum upon the grain, or the changing of carbon from the combined to the graphitic state. The white of the original iron is turned to gray when reaching the fifth heat, each addition of aluminum producing a corresponding change of color, showing conclusively that aluminum causes the combined carbon to take the graphitic form. The influence of the aluminum is such that a thin casting is as gray as a thick casting.

Fourth—It takes away the tendency to chill. Chill is caused by molten iron running against a body which rapidly withdraws its heat, causing it to retain its carbon in the combined form. Aluminum causes the carbon to be turned to graphite before it can be caught in its combined form.

Fifth—Aluminum causes a lessening of the thickness of the sand scale, making it easier to cut the metal.

Sixth—The resistance to a load gradually applied. All the tests show that aluminum has increased the strength.

Seventh—The resistance to a load suddenly applied, or impact. The tests show that the power to resist a blow has increased more rapidly than to resist a dead weight. The increase in strength is due probably to the soundness of the castings.

Eighth—The elasticity. The compactness of the grain, and the increase of graphite, increases the elasticity when the aluminum is added.

Ninth—Permanent set is less for the reasons just given.

Tenth—The effect upon the shrinkage of the iron. The sudden changing, due to aluminum, of the combined carbon to the graphitic form, at the instant of solidification, on account of the increased space occupied by the graphite, causes a swell at the instant the metal becomes solid, and the iron on cooling will occupy more space, or will shrink less. White iron often shrinks three-tenths of an inch to the foot, while gray iron sometimes shrinks as little as one-tenth of an inch. Aluminum, therefore, when added in sufficient quantities, takes out shrinkage.

Eleventh—The fluidity of the metal. The tests show that aluminum added to iron low in silicon increases fluidity, but that as the silicon increases aluminum does not add to the fluidity, though it tends to produce sharp castings.

This brief summary of Mr. Keep's paper shows the great benefit which is now promised to the iron founders by the rapidly falling price of aluminum as cheapened by the electric furnace. The paper is to be followed by a second, giving the chemical proof of the correctness of these statements.

Prof. James E. Denton of Stevens Institute at Hoboken, N. J., contributed two papers, one being an account of observing the color of an escaping jet of steam and in that manner identifying its percentage of contained moisture. The other paper contained the results of long continued experiments upon steam engines using steam by expansion and throttling respectively. The paper was illustrated by numerous charts and graphical tables.

The large hall of the building was assigned to this section for an afternoon to afford facilities for illustrating of the screen a lecture on the Panama canal as it is, by Wolfred Nelson, M.D., who has lived on the Isthmus of Panama during the last five years. He said: The Panama canal as it is to-day deserves some attention. M. de Lesseps after assuring the world that locks never should desecrate any canal that he had to do with, and after pouring ridicule upon them for a lifetime, not only is forced to fall back upon locks, but actually accepts the very designs for them made by M. Eiffell for a former Nicaragua canal company. Now, a word as to M. Eiffell, who is building the modern tower of Babel. M. Eiffell is a French engineer, known to fame; he has contracted to build the gates for M. de Lesseps' lock canal. My knowledge of M. Eiffell's contract for building the gates—if such a document can be called a contract—was obtained from one of M. Eiffell's own engineers during my late visit to Panama in Marsh last. M. Eiffell axacted a deposit of 10,000,000 of francs or $2,000,000. It was deposited with two banking houses. His engineering staff were paid six months in advance by the canal company. The Eiffell contract calls for ten gates, generally stated in the press as ten locks. He contracts for the gates at 5,000,000 francs each or $1,000,000 from his designs for the Nicaragua canal. The masonry and wherewithal to make a lock, properly so called, will be an extra charge. So much for start; $2,000,000 in hand, staff paid six months in advance and no security axacted from M. Eiffell. From A to Z his security is absolute. Then there were other conditions, all in his favor, such as the payment of one-third of the value of the work when it was shipped from French ports, another third when it reached Colon and the remaining third when the gates were placed in position, and back of all this the deposit of $2,000,000. Ten locks—the first on the Atlantic side—will be at or near Bohio Saldado, last or tenth on the Pacific or Panama side at Miraflores. In fact it means a locked canal, pure and simple. Canals as a rule, require water; that is, ship canals. As there are no mountain streams to feed the upper levels a supply of water must be had. Away up there, nearly three hundred feet above sea level, they intend making a huge pocket, or reservoir, which will aliment or feed the canal when it is done. This projected reservoir will be filled by pumping stations, at various places. The canal is a huge and delightful riddle—to those who have no stock.

To conclude, M. de Lesseps task is hopeless, and he has known it for years. To-day the annual or fixed charges of the company are over $20,000,000. While at Panama I so stated them in a letter to the *Gazette*, Montreal. Yesterday I find my estimates were under, and to-day it costs the company $22,000,000 for interests and office management. The end is at hand. By January 1, 1889, the collapse will have overtaken the management. To one who knows France and the character of her working class, one can forecast the epidemic of suicides that will follow the breaking of this most gigantic of South sea bubbles—La Belle France—and what a noble country she is. She will be shaken to her center by whom?

NOTES.

Cleveland is magnificent in its distances as well as people, trees and residences; the high schools where the sessions were held being over two miles from the hotels.

Many of the members were unfortunately led by the circular of announcement issued in advance of the meeting to stop at one of the hotels which was first class only in prices and architecture; the waiters were not of a sufficiently advanced stage of evolution to attend to written order slips.

The newspaper reports were prepared with a fullness and accuracy exceeding that of any previous meeting. Arrangements were made by which copies of the papers were given to reporters for abstracts. Several errors crept in. A vice-president's address upon "Some Phases in the Progress of Chemistry," was printed Christianity. The section of mechanical science and engineering was made to appear as engraving.

Prof. T. C. Mendenhall, president of the Rose Polytechnic Institute at Terre Haute, Indiana, is the president elect, and will preside over the meeting at Toronto, Canada, next year.

The best joke among the party was that of a wise ex-president who cast his ballot for the place selected for the next meeting because being in Canada, it was a good place To-run-to.

There were receptions, lawn parties, teas and excursions galore, but the excursion in a steamer to Put in Bay was perfection in all its arrangements and environment.

The frequency of meetings in the Middle States has had a marked tendency to limit the attendance, in great measure, to those living in that section. A wider diversity of locality in the selection of invitations would be preferable.

An Electric Search Light Projector.

The Brush Company, of London, has made a large number of ship fittings, and have made ship lighting a special feature. In this issue we illustrate the company's search light projector and the methods of using it. The arc light for this purpose is of very much greater candle-power than the ordinary arc lights, which are nominally 2,000 candle-power, taking 10 amperes of current. In the *Electrical Engineer*, of London, it is stated that the search light for projectors often takes from 75 to 150 amperes of current, giving a light of 30,000 candle-power. One of these arc lamp projectors is shown in the illustration for use on board ship. The thick carbons are regulated by a hand feed, and the movement of the lantern is effected in two ways—by hand, for rough adjustment, in which case the lower handle, which operates a lock-nut, is loosened, and the whole lantern then moves by hand; and for finer adjustment the lock-nut is tightened, and the worm gearing serves to effect any desired degree of elevation or depression. A feature lately added to these projectors is the flashing arrangement for sending signals. The upper handle shown operates two discs of blackened sheet metal, closes them together with one motion to allow the full beam to pass, and opens them out with the reverse motion to cut off the light; by this means long or short flashes can be used to signal in the Morse code.

These projectors are also much used for navigating difficult passages at night, especially in the Suez Canal, where special apparatus is arranged on the stem of the boats, with a look-out man to discern the way. An illustration of the Suez Canal projector in action is given.

More City Lighting by Electricity in Brooklyn.

Supervisor-at-Large Quintard has addressed the following letter to the Board of Supervisors, Brooklyn, in relation to the lighting question: "In a communication to the Board, presented at the meeting of May 27, 1886, I called attention to the enormous charges for gas at the County Jail, which were then running from $6,000 to $7,000 per year. I did not believe that this amount of gas was actually consumed there, and I again remind the Board of the fact that the gas bills for the jail aggregated $8,000 for 1887, and, judging from the rates for the first half of the present year, the gas companies evidently intend to pile it on to the county to the tune of nearly $10,000 for 1888. At various times, both in person and by proxy, I have, at all hours of the night, observed the consumption of gas, and I am sure that any intelligent citizen who will take similar trouble can only arrive at the same conclusion—that, considering the county pays but $1.50 per 1,000 feet, it is impossible to believe that these enormous bills for the jail are legitimate. Apparently, however, we have no redress, for if your honorable body holds back the bills or refuses to approve them, you will be met with testimony to the integrity of the meter, charged with sinister motives, and with contemplating a 'strike' upon the immaculate gas companies, or with having no bowels of compassion for the 'poor widows and orphans' who own the stock. The former Sheriff told me that, in his opinion, the examination of the meter by the company's inspector was a mere farce; and the Chairman of the Finance Committee, the Hon. Jno. L. Ryder, of Flatlands, also informed me that he had long been impressed with the belief that the charges for gas at the jail were largely in excess of the actual consumption, but that he had failed to devise any actual check, and so had been obliged to certify to them, while morally convinced that they were overcharges. In the communication to which I have already referred I recommended the substitution of electricity for gas as a means of lighting the jail and grounds, and this recommendation, with hearty concurrence of the Sheriff and his predecessor, I again strongly renew. Probably the present electric lighting companies will agree to put in the plant and furnish the light on reasonable terms."

It would now seem to be in order for the gas companies of Brooklyn to make a few remarks.

The Electric Road in Davenport.

A great success! A wonderful affair! An immense advance for Davenport was the verdict pronounced Sunday evening after the first electric car in Iowa had made several trips over the line, says the Davenport, Iowa, *Tribune*. Car No. 2 started Sunday at 3 o'clock, A. M., and went over the road to East Davenport at a terrific speed, without a single hitch, with no stops at switches or corners, which were made with perfect ease. Sunday evening everyone was watching for the car which started at Second and Brady at 9.40, went up Brady to 15th street, thence east to the end of the line, thence back to Brady, and north to Central Park, then down Brady to the power station; in all, a distance of 5¾ miles in 38 minutes. Not a single flaw was found either in trolley wire or ground wire. The route taken is made with horses in one hour and twenty minutes, and includes the long Brady street hill, 1,300 feet, with 7/10 per cent. grade; 300 feet on 13th street of 5 per cent. grade; and 300 feet north of Locust of 3 per cent. grade; eight switches to be made on the round trip, 12 curves and three railroad crossings. The car lighted by five 16 candle-power Edison lights was certainly a remarkable and beautiful sight.

FIG. 1.—ELECTRIC SEARCH LIGHT.

The cars were built by the LaClede Company, St. Louis, and are made very strong, with three-inch axles and heavy wheels, and weigh with the motor attached, 3,600 pounds; they are 22 feet long over all, and have the swinging gear so as to take the corners easily. They are beautifully finished. The motors are 7½ horse-power each, and are hung to each axle, and both are worked at the same time from either end of the car, by means of a switch which the "car operator" regulates with his left hand while managing the brake with his right. At either end of the car is an electric fare box, which rings a bell as each fare is dropped into the box, and registers each as it drops below out of sight. The Central road was the first electric road to use these boxes. The trolley is so placed on the roof of the car as to allow plenty of motion to the trolley wheel, but keeping the latter pressed up against the under side of the overhead or trolley wire. The car receives its power from the trolley wire.

The current generated from the two car dynamos is of from 400 to 450 volts only, and is by no means dangerous. Mr. Sprague writes: "The pressure need not be more than 450 volts, and my men have frequently gotten shocked, both in practice and by way of a practical joke at from 400 to 600 volts, which is not comfortable, of course, but from which they have never suffered any inconvenience." The third dynamo gives a pressure of 220 volts only, which will be used to furnish power for motors for printing presses, elevators and machinery of most any kind.

FIG. 2.—SUEZ CANAL PROJECTOR.

—— The Westinghouse Electric Company, of Pittsburgh, Pa., has declared quarterly dividend No. 2, of one and one-half per cent., payable August 25th.

—— During the recent storm in Montreal, the electric light station was set on fire by lightning and considerable damage done. In the harbor all the electric lights, extending from the foot of McGill street to Hochelaga, were instantly extinguished, as were also the electric lights on the canal. In the electric light station the electrician and his assistant were benumbed by the shock.

—— The Evansville, Indiana, Citizens' Electric Light Company, which was recently denied a franchise by the City Council, has applied for a mandamus against the Evansville Gas and Electric Light Company. Plaintiffs also implead the Council in the application, in which they urge that the municipal legislature has no constitutional right to clothe any corporation with exclusive privileges, and that the Evansville Gas Light Company, which is now made a monopoly, has no legal right to the streets of the city, to the exclusion of other companies. The supreme court has just handed down a decision in another case which very emphatically denies such rights to a municipality, and it is upon the strength of this decision that the new company is proceeding.

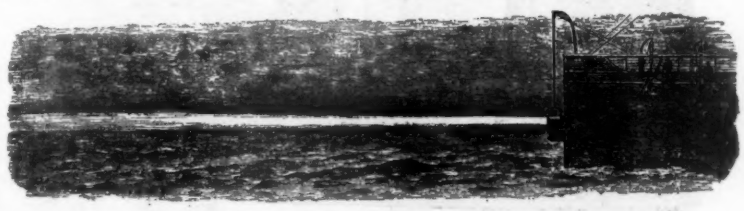

FIG. 3.—PROJECTOR IN USE ON SHIP.

ELECTRIC LIGHT NEWS

—— A. E. St. Cloud will erect an electric light plant at Ashland, Va.

—— The Hillside Works at Forest City, Pa., are to be lighted by electricity.

—— Mr. S. Adams, president of the Lynchburg, Va., street railroad, is preparing to run the cars by electricity.

—— The Gainesville, Tex., Electric Light, Heat and Power Company, will add an incandescent lighting plant with a capacity of 1,300 sixteen candle-power lights.

—— Newark capitalists, interested in electric lighting, are thinking favorably of introducing a plant in Montclair, N. J., and putting in incandescent lamps in private houses and stores.

—— E. J. O'Bierne, representing the Thomson-Houston Electric Light Company, is negotiating for the erection of an electric light plant in Meriden, Miss. It is reported that he has obtained the franchise.

—— The Tucker Electrical Manufacturing Company has just completed the installation of a plant of about 700 lights at the new theater of Mr. Gustav Amberg, on Irving place, between 14th and 15th streets, formerly Irving Hall.

—— The Standard Electric Company, of Vermont, has been awarded the contract for lighting the streets of St. Johnsbury, Vt., and is engaged in putting in the plant. The same company has also been awarded the contract for arc lighting at Newport, Vt.

—— The electric light contract made by the council of Newark was vetoed by the mayor on the ground that the present council could not thus bind the future city fathers. The resolution awarding the contract for five years was passed over the veto.

—— The Passaic, N. J., Electric Light, Heat and Power Company had its dynamos running last Monday night, and several of the stores were lighted with the incandescent light. A sample of the light they propose to furnish to the city for $19 per light per year was exhibited.

—— The Macon, Ga., Gas Light and Water Company is adding a complete arc and incandescent plant to its property, using the Thomson-Houston system. This will make two electric light plants in that city, and the citizens are happy over the prospect of plenty of light at resonable rates.

—— The Eau Claire Brush Electric Company, Eau Claire, Wisconsin, have recently ordered fifteen 2,000 c. p. arc lamps from the Brush Electric Company, Cleveland, Ohio. The Eau Claire Company have made large additions to their station during the past year, and are reported to be in a very flourishing condition.

—— The plant of the East End Electric Light Company, of Pittsburgh, was entirely destroyed by fire recently. Spontaneous combustion is the supposed cause. Loss, about $25,000; insurance, $20,000. Arrangements were made with the Allegheny County Light Company for service until the plant is rebuilt, which will be in about two weeks.

—— The South Pittsburgh Power Company, recently incorporated and granted privileges by city councils, is negotiating with the Edison Company for the adoption of that system. The light company proposes to start out with 600 lights. Operations will at present be confined to the Twenty-seventh and Thirty-first wards and Mount Oliver. It will eventually be extended over the entire South Side. Work will be begun on the power house shortly. It will likely be located on Mount Oliver. The plant will cost $20,000. It is expected that light will be furnished at the rate of one cent per hour for each burning light. The incorporators and directors of the company comprise some of the best business men in the city.

ELECTRICAL AND SCIENTIFIC

* * Lightning flashes, according to a recent computation of Kohlrausch, the German electrician, have comparatively little energy. He estimates that the energy of from seven to thirty-five flashes would be necessary to keep one incandescent lamp alight for an hour.

* * A system of electric lighting for tram cars, the invention of M. Ch. Gauzents, a Belgian electrician, has recently been tested on the Bradford tramway system, with favorable results. Its adoption is now under consideration. The special feature consists in providing the light direct from the battery, which is situated on the floor of the car under the seats, as opposed to the usual method of accumulators.

* * An electric bulletin board is one of the latest devices. Thirty or forty instruments or boards may be worked from a central office. The device consists of a number of lettered wheels in a row, and these are revolved so as to show the letters to spell out the news through a horizontal opening in the case. It is not intended to have a record of the news it conveys, but is designed merely to satisfy the eagerness for news, and then makes room for a succeeding announcement. It is on exhibition in New York, but is not yet in extended operation.

* * The Pittsburgh *Dispatch* says that several of the south side glass factories are now using electricity for cutting glass. Heretofore when they wanted to cut one of the large cylinders of window glass a simple but primitive method was used. This consisted of the pulling out from the furnace of a thin shred of glass heated white. This was quickly wrapped around the bottle-shaped end of the cylinder, and it burned through or fractured the glass. A pair of tongs had to be used in the process. By the new method the glass cylinder is encircled with a fine wire, the extremities of which are put in connection with a small electric battery. It is necessary that the wire adhere closely to the glass. When a current of electricity is passed through the wire it becomes red hot and heats the glass beneath it. Then a single drop of water deposited on the heated place will cause a clean breakage of the glass clear around in the path of the wire. Contrary to what takes place with the usual process in the treatment of this fragile material, it is found that the thicker the sides of the cylinder the better the cut.

Don't Want to be Named as the Electrical Executioner.

Sheriff Grant, of this county, is a rich man, but even if he were poor, he declares nothing would induce him to stand for re-election. The office is reckoned as worth about $40,000 a year to its holder, but Grant asserts that he wouldn't have it after the 1st of next January at five times that profit. His reason for this positive view is that the noose for murderers is to be displaced by electricity.

"There is no doubt about it that death by electric shock is easier than breakage of the neck, and far more so than strangulation," the sheriff explained; "and the change will be humane. But I wouldn't for the earth have my name go down the ages as a synonym for capital punishment. The executioner at the time hanging was adopted in England was Jack Ketch, and that's the hangman's title yet. Dr. Guillotin instituted decapitation in France, and hence the guillotine. The Spanish machine for breaking murderers' spinal columns is called the garrote, from Jarroti, the inventor. Now, just as likely as not, the first sheriff under whom a culprit is electrified to death will be compelled to contribute his name to the new method. I will not take the risk."

The Baxter Motor for Constant Potential Circuits.

We take pleasure in illustrating this week the new design Baxter motor, as made for constant potential circuits, and the automatic cut-out box used in connection with the same.

These motors are made in all sizes from one-half horse-power up, and are wound for all the electro-motive forces used in constant potential circuits. By comparing the illustration of the Baxter constant current motor published in the REVIEW August 25th, with the present one, it will be seen that the frames of the machines are identical in outward appearance, and that the difference between the two consists in the way in which they are governed for speed regulation. The constant current motor requires some mechanical device for maintaining the speed constant under varying load and strength of current. This device is omitted in the constant potential system, the armature and field being wound to affect the regulation.

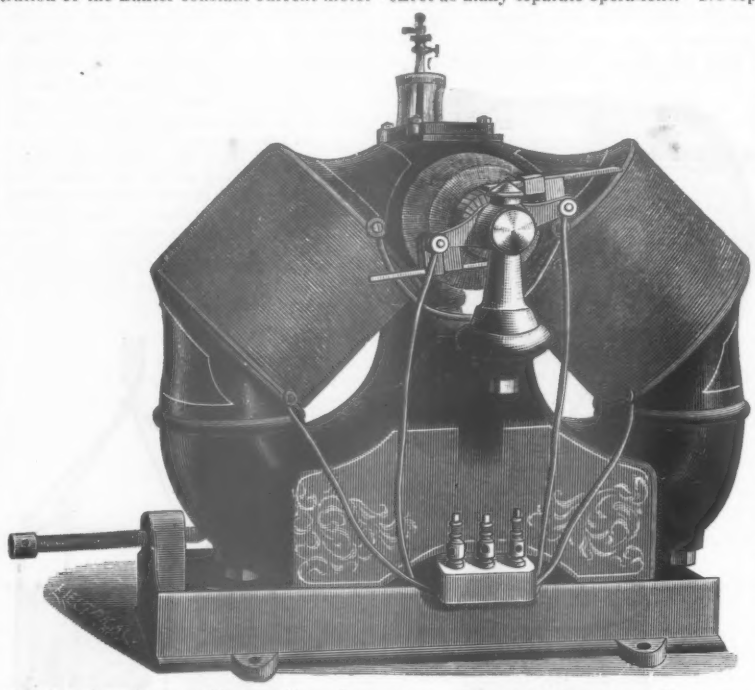

FIG. 1.—THE BAXTER MOTOR (NEW DESIGN) FOR CONSTANT POTENTIAL CIRCUITS.

The motors of this system possess all the qualifications of those intended for constant current circuits, viz: high efficiency, substantial construction, handsome appearance, compactness, cleanliness, and large power for size and weight of machine.

The automatic cut-out box, devised by the inventor, effectually prevents any mishap to the motor from an excessive current which would otherwise destroy the armature when starting or under a heavier load than the motor is designed to carry. The great merit of the box lies in its extreme simplicity and absolute reliability in cutting out the motor when the current has reached an unsafe limit. As it is operated by the single lever shown, no confusion can result when an attempt is made to start the motor, as is the case with motors of this system when two or more levers and handles are employed to effect as many separate operations. No separate switch is required with which to start and stop the motor; there is no separate handle which makes and breaks the field connections; or one to throw the resistance into and out of the armature circuit. All of these operations are effected by one single lever and by a simple, straightforward, upward movement which makes the functions of each connection positive in its simplicity. Two contact springs are carried by this swinging lever which has its upward movement opposed by a spiral spring situated at the pivot. When an attempt is made to start the motor, the contact nearest the pivot first completes the field connection, which is followed immediately after by the outer contact closing the armature circuit through all the resistance in the box. The armature then begins to revolve. As the speed increases and the counter-electromotive force rises; this resistance is gradually cut out by the slow, upward movement of the lever until the last block is reached when the switch is automatically locked in that position by the device attached to the armature of the actuating magnet. This magnet is included in the circuit, and its influence upon its armature will, therefore, vary proportionally with the strength of the current, increasing and decreasing therewith. When the current increases to an abnormal or unsafe degree from an excessive load or other cause, the magnet immediately attracts its armature, trips the locking device, the lever falls under the pressure of the spiral spring and instantly opens the circuit before any harm has been done to the machine. Likewise, if the locking device fails to act when the motor is pushed up on starting, it is an indication that the motor is overloaded at the start. As an additional precaution to the safety of the machine, the usual fusible strip is inserted in the circuit, guaged to melt at a strength of current a little beyond that for which the trip magnet is set. It often happens when incandescent motors are working under heavy and variable loads that the current is momentarily sufficiently high to blow out the safety fusible strips, and much annoyance and time is spent in replacing them. With the Baxter automatic cut-out box it is a simple matter to again raise the lever which has fallen under the momentary excess of current, and a man with his eyes shut could scarcely go wfong. The spiral spring also renders it impossible to start the motor and leave the contact in a midway position upon the resistance blocks, and thus burn out or injure the resistance.

FIG. 2.—AUTOMATIC BAXTER CUT-OUT BOX.

The box is neat and compact in appearance, perfectly automatic in its action, and is a most efficient and reliable apparatus.

The Buffalo International Exposition.

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The cash premiums will be the largest ever offered by any fair in the world.

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Exhibits from nearly every province in the Dominion of Canada will be shown, and many valuable European exhibits are already assured. The Canadian exhibits will be the largest ever shown in America.

The art gallery will contain several of the most celebrated paintings in the world. In the machinery and horticultural halls, and in the agricultural and industrial departments, will be shown the greatest inventions and devices and the most wonderful natural and industrial products of this marvellous day of civilization.

Buffalo is at the foot of the great lakes; at the head of the Erie canal; is entered by *twenty-two* lines of railroads, over which 248 passenger trains arrive and depart daily; has a population of over 250,000, and is better located for an International Exposition than any other interior city in America.

The Exposition will be open from September 4th to 14th, 1888.

Messrs Hamlin, Stevens and Robinson have achieved a greater success in expositions than any one since the time of Gen. A. T. Goshorn at the Centennial.

Electric Light Injunction Dissolved.

The injunction recently granted enjoining the corporate authorities of Frederick, Md., from paying out any money for the purchase of an electric light plant, upon the ground that they had no authority to so use funds specifically levied for other purposes, was, by agreement between counsel, dissolved last week. The petition that the further operation of the machinery at the present location be restrained, is held for further consideration. A new engine of 80 horse-power will now be substituted for the 60 horse-power.

—— The Duluth, South Shore & Atlantic R. R. Company, Marquette, Mich., have recently increased their arc light plant by ordering a number of arc lights from the Brush Electric Company, Cleveland, Ohio.

The "Victor" Turbine.

The interest in the best use to be made of nature's supply of power has always been great, and this method of energy has always possessed a fascination for the men engaged in generating electricity, either for lighting or power purposes. When the earnest but somewhat irreverent delegate at the first National Electric Light Convention answered a query by stating that his engineer was "the good Lord," every one who heard him knew he was the envied possessor of water power, and able to take advantage of a situation where neither engineer, nor fireman, nor coal bin were required. The illustrations herewith present views of several settings of the "Victor" turbine, adapted for electric light stations. The manufacturers, the Stillwell & Bierce Manufacturing Company, of Dayton, Ohio, have paid particular attention to this field, and have won most creditable renown for the work done by them. The various illustrations presented will interest every one interested in this class of power, and are described by figure beneath each.

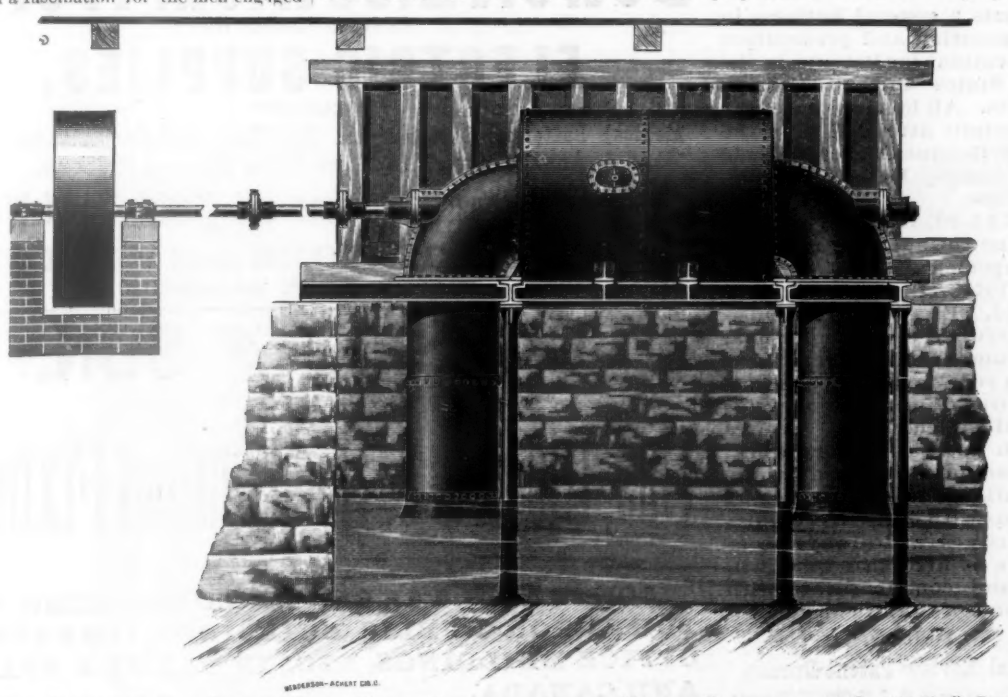

FIG. 5.—SIDE ELEVATION OF A PAIR OF 35-INCH VICTOR TURBINES IN COTTON MILL AT WOONSOCKET, R. I.—265 H. P. DEVELOPED.

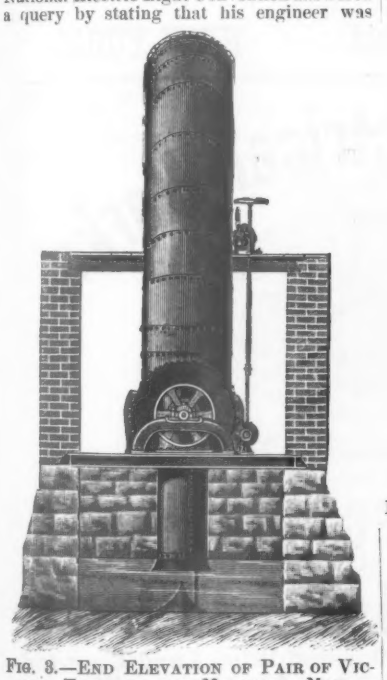

FIG. 3.—END ELEVATION OF PAIR OF VICTOR TURBINES AT METHUEN, MASS.—DEVELOPING 400 H. P.

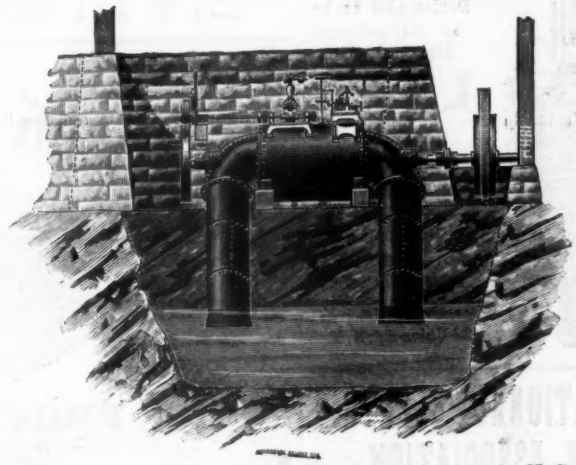

FIG. 4.—END ELEVATION OF PAIR OF VICTOR TURBINES AT HENRIETTA, N. C.—386 H. P.

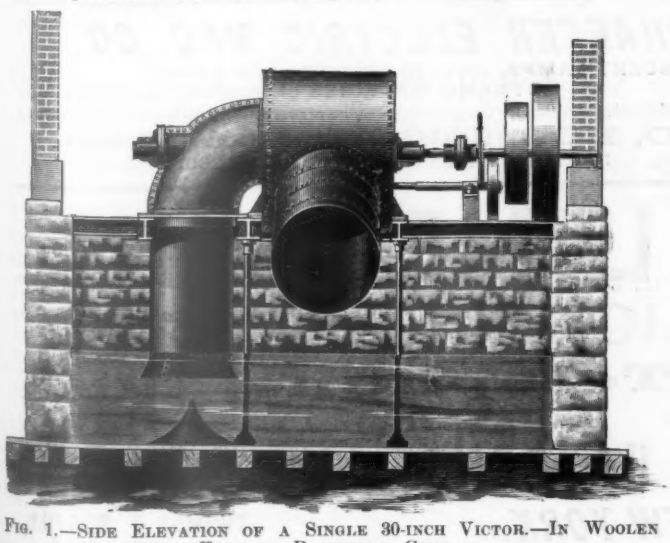

FIG. 1.—SIDE ELEVATION OF A SINGLE 30-INCH VICTOR.—IN WOOLEN FACTORY, ROCKVILLE, CONN.

FIG. 2.—END ELEVATION OF 35-INCH VICTOR TURBINE AT MIAMSBURG, O.—155 H. P. DEVELOPED.

Rival Electric Light Companies.

On Thursday evening, workmen in the employ of the Edison Electric Light Company in laying their conduits at Seventh and Jayne streets, attempted to go through a manhole belonging to the Keystone Light & Power Company, which also have conduits at that point, without securing permission from the latter company, says the Philadelphia *Ledger*. The Keystone Company notified the Edison Company to desist, but, it is said by a Keystone official, the latter claimed to have "permission from the city." However, at 8 o'clock on that evening, the Keystone Company put a gang of men at work and filled the manhole solid with fire brick, thus preventing the Edison men from entering the manhole. Early yesterday morning a compromise was agreed on, and the Edison Company began laying its conduits in a manner satisfactory to the Keystone Company.

Sydney, Ohio.—The Sidney Electric Light Company, Sidney; capital, $15,000; W. H. Thompson and others, incorporators.

New York.—The Gibson Electric Company, New York City, capital stock, $10,000. C. D. P. Gibson and others, incorporators.

Muskegon, Mich.—The Muskegon Electric Light Company of Muskegon, capital stock, $50,000; R. E. Bunker and others, incorporators.

Chicago, Ill.—The Electric Health Drink Company, capital stock, $350,000; incorporators, Clemens Plager, Christ Weihrman and H. A. Richter.

Mount Vernon, Ohio.—The Mount Vernon Electric Light Company of Mount Vernon, capital stock, $35,000; P. B. Chace and others, incorporators.

Chicago, Ill.—The Boulder Electric Gold and Silver Reduction Company, of Chicago; capital, $1,000,000. Incorporators, O. N. Hartshorn, Hubert D. Crocker and Welford D. Crocker.

Jersey City, N. J.—The Hauss Electric Company, with a capital stock of $240,000; David J. Hauss, James S. Gerbe and Ira S. Elkins as directors, propose to manufacture electrical apparatus.

Chicago, Ill.—The American Telephone Sonoretta Company, capital stock, $50,000; incorporators, Charles S. Clark, George L. Lavery, F. S. Baker, Charles W. Morehouse and N. W. Hartwell.

Des Moines, Iowa.—The Wells Electric Motor Company, capital stock, $100,000; incorporators R. N. Bayless, Jesse O. Wells, Samuel Merrill, H. E. Tenohaut, W. M. Lamphere and D. H. Ogden.

Whitesboro, N. Y.—The Whitesboro Electric Light and Power Company, capital stock, $5,000. Trustees J. W. Boyle, C. S. Smith, James Stepenson, C. S. Foster, W. C. Aldridge, D. E. Crane and R. A. Jones.

Des Moines, Iowa.—A company has been formed in Des Moines, with a capital of $100,000, for the manufacture of the Wells electric motor for the purpose of building and operating electric motors and leasing the same. Jesse Wells is the patentee, and the incorporators of the company are: R. N. Bayless, Jesse O. Wells, Samuel Merrill, H. E. Teachout, Wm. M. Lamphere, Albert T. Hess and David H. Ogden.

—— The New York Subway Board, through Commissioner Hess, has sent a letter to the Board of Aldermen based on the recommendation of the Coroner's jury which investigated the death of Frederick S. Witte that a corporation ordinance be passed compelling all electric light companies to insulate their lamps and wires more effectually, and to insert a clause in contracts with patrons warning the latter not to touch the lamps or wires. The aldermen are referred to their own records for proof that the United States Illuminating Company, from whose wires Witte and Striffer received the deadly current, has never been duly authorized to stretch any wires above ground in any street or highway of the city. And, in conclusion, an appeal is made for the aid of the aldermen and "the whole power of the municipal government." Commissioner Hess also sent a letter to the Commissioner of Public Works, saying that dead wires and poles are unlawful obstructions, and should be removed at once. Corporation Counsel Beekman has obtained from Judge Patterson an order directing the United States Illuminating Company to show cause why they should not be restrained from maintaining their aerial lines where subways are ready and should not be compelled to remove the poles and wires.

ELECTRICAL PATENTS

(Copies of any Patents in the following List will be sent to any address on receipt of twenty-five cents.)

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING AUGUST 19, 1888.

388,008 Electric signaling; Clement Ader, Paris, France.

388,023 Railway signal; Thomas P. Curry, Danville, Ky.

388,052 Multiple switchboard; Milo G. Kellogg, Hyde Park, Ill.

388,053 Arc lamps; Virgil C. Killin, Chicago, Ill.

388,078 Machine for tempering metal wires and strips; Frederick Sedgwick, Chicago, Ill.

388,091 Harmonic telegraphy. 388,092 Telegraph receiver; Francois Van Rysselberghe, Brussels, Belgium.

388,093 Dynamo electric machine; Montgomery Waddell, New York, N. Y.

388,140 388,141 388,142 388,143 Electrical type writer; James F. McLaughlin, Philadelphia, Pa.

388,152 Non-magnetic alloy; Alfred H. Roberts, Ponts Martel, Switzerland, assignor to C. Huguenin, Thiebaud & Fils, same place.

388,181 Galvanic battery; Howard Cassard, Baltimore, Md.

388,242 Pneumatic intermittent circuit closer; William C. Barney, New York, N. Y., assignor to Josiah C. Reiff, same place.

388,244 Printing telegraph; Jean M. E. Baudot, Paris, France.

388,245 Method of working metals by electricity. 388,246 Apparatus for working metals by electricity; Nicholas Bernardos, St. Petersburg, Russia.

388,247 Current collector for electric railways; Josiah L. Blackwell, New York, N. Y.

388,283 Multiple switchboard; Milo G. Kellogg, Hyde Park, Ill.

388,294 Electric gas lighter; John J. McGowen, Ithaca, N. Y.

388,300 Electric steering apparatus and torpedo boats; James O'Kelly, London, and Bernard A. Collins, Nunhead, County of Surrey, England.

388,312 Battery zinc; Benjamin Scarles, Clinton, Mass., assignor of one-half to Charles Swinscol, same place.

388,333 Telegraph receiver; William T. Barnard, Baltimore, Md.

388,335 Secondary battery; John Beattie, Jr., Westport, Mass.

388,344 Circuit closer for call systems; Charles E. Dey, Denver, Col.

388,357 Fire telegraph. 388,358 Automatic fire telegraph; John H. Guest, Brooklyn, N. Y.

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THE NATIONAL ELECTRIC LIGHT ASSOCIATION.

July 25th, 1888.

The Semi-Annual Meeting of the National Electric Light Association will be held at Hotel Brunswick, New York City, August 29, 30, 31. All communications relating to this Convention to be addressed to

DR. OTTO A. MOSES,
Chairman Executive Committee,
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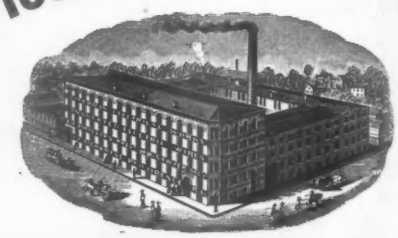

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